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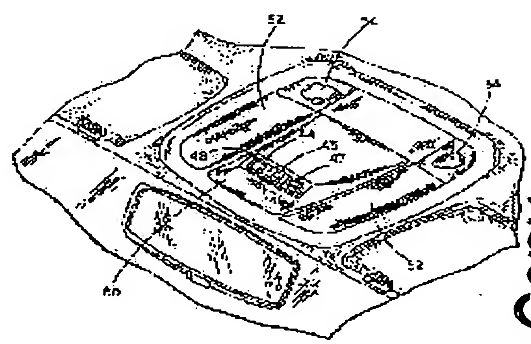
(54) MULTIPLEX FREQUENCY TRANSMITTER

(57)Abstract:
PROBLEM TO BE SOLVED: To reduce RF fading in a vehicle transmitter that sends a coded RF signal to start remotely a garage door opening device or the like.
SOLUTION: The transmitter is provided with operating switches 44, 46, 47 provided for a crew and a signal generator coupled with the operating switches to sequentially generate and send at least two control signals having different RF carrier frequencies and the same code in response to the operation. The control signals are sequentially sent by slightly different carrier frequencies within a band width of the receiver of a remote controller to minimize a blank depending on the frequencies of a transmission pattern thereby reducing the RF fading due to a reflection from a vehicle. The transmitter may be a multiple channel transmitter or may be a training enable transmitter that learns a start signal including the RF carrier frequency modulated by the code for remote operation and sends the signal.



CLAIMS

[Claim(s)]
[Claim 1] In the transmitter for cars which transmits a RF signal to the receiver aligned with the 1st frequency in order to carry out the remote start of the equipment It is combined with the actuation switch which it had in order to operate by the crew of a car, and said actuation switch. The transmitter characterized by having signal generation equipment for carrying out sequential generating of at least two control signals which have RF carrier frequency which serves as an individual following actuation of said actuation switch, and transmitting.
[Claim 2] The transmitter according to claim 1 characterized by one of said the RF carrier frequencies being said 1st frequency.
[Claim 3] Said signal generation equipment carries out sequential transmission of the 3rd control signal at the 1st control signal, the 2nd control signal, and a degree. Said 2nd control signal has 2nd RF carrier frequency corresponding to said 1st frequency of a receiver. It is the transmitter according to claim 2 characterized by having 3rd RF carrier frequency with said 3rd control signal higher [that said 1st control signal has 1st RF carrier frequency lower than said RF carrier frequency] than said 2nd RF carrier frequency.
[Claim 4] Said signal generation equipment is a transmitter according to claim 1 characterized by only a predetermined duration carrying out sequential transmission of each of said control signal.

[Claim 5] Said transmitted control signal is a transmitter according to claim 1 characterized by becoming irregular by the same data code.
[Claim 6] In the approach of carrying out the remote start of the equipment which has the receiver aligned with the bandwidth for receiving the control signal which has predetermined RF carrier frequency and a predetermined code The step which operates a switch, and the step which generates the 1st control signal which has said predetermined RF carrier frequency and said predetermined, predetermined code, and is transmitted following actuation of a switch, the step which generates the 2nd control signal which has said predetermined code and RF carrier frequency which only the specified quantity isolated from said predetermined carrier frequency, and transmits this to a receiver after transmission of said 1st control signal -- since -- the approach characterized by becoming.
[Claim 7] In the transmission-and-reception machine in which training for the cars for transmitting the modulated RF signal which has the code learned in order to learn the property of the received seizing signal containing RF carrier frequency and a code and to carry out remote actuation of the equipment is possible It is the control unit combined with the receiver for receiving RF seizing signal from a remote-control transmitter, and said receiver. The data showing RF carrier frequency from which RF seizing signal received when RF carrier frequency and the code of RF seizing signal which were received were identified and it was in training mode was discriminated, and a code are memorized. Said control unit which generates two or more frequency control signals with which RF carrier frequency with which the seizing signal with which each was received was discriminated from read-out and the memorized data in the memorized data when it was in a transmitting mode expresses a different RF frequency, The code which was combined with said control device, and received a frequency-control signal and the memorized data showing a code, and each learned, The transmission-and-reception machine which is characterized by having the transmitter which carries out sequential generating of two or more modulated RF control signals which have a different RF carrier frequency corresponding to each frequency control signal supplied by said control unit, and is transmitted and which can be trained.
[Claim 8] Said control device is a transmission-and-reception machine which is characterized by said training mode actuation being [said] turned on if only a predetermined period operates, and going into said transmitting mode if only the period when said actuation switch is shorter than said predetermined period operates and in which training according to claim 7 is possible, including further the actuation switch which it had so that it might be combined with said control device and might operate by the crew of a car.

[Claim 9] Two or more actuation switches with which it is combined with said control unit, it has so that it may operate by the crew of a car, and each corresponds to two or more different one of the channels, The memory for memorizing the data showing the frequency from which it is combined with said control device, and each has two or more addressable storage areas relevant to one of said the channels, and the received seizing signal was discriminated, and a code, An implication and said control device will go into said training mode for one of said channel, if only the period predetermined [one] when said actuation switch corresponds operates. Said control device When only the period when one to which said start switch corresponds is shorter than said predetermined period operates, to said transmitting mode close The transmission-and-reception machine which is characterized by sending two or more modulated RF signals which have the learned code which was memorized in said memory relevant to one of said the channels and in which training according to claim 7 is possible.
[Claim 10] In a transmitting mode, said control device generates the 1st, 2nd, and 3rd frequency control signals for the memorized data from read-out and the memorized data. Said 1st frequency control signal expresses the 1st frequency lower than identified RF carrier frequency. While said 2nd frequency expresses the 2nd frequency almost equal to identified RF carrier frequency and said 3rd frequency control signal expresses the 3rd frequency higher than identified RF carrier frequency The 1st modulation RF signal which has the learned code from which said transmitter was modulated by the 1st frequency in the modulation, The transmission-and-reception machine which is characterized by carrying out sequential generating of the 2nd modulation RF signal which has the learned code which was modulated on the 2nd frequency, and the 3rd modulation RF signal which has the learned code which was modulated on the 3rd frequency, and transmitting and in which training according to claim 7 is possible.
[Claim 11] It is the transmission-and-reception machine in which training according to claim 10 characterized by being higher than RF carrier frequency from which said 1st frequency was lower than RF carrier frequency from which the received seizing signal was discriminated 500kHz, and said 3rd frequency was discriminated 500kHz is possible.
[Claim 12] Said control unit is a transmission-and-reception machine which is characterized by said transmission-and-reception machine controlling said transmitter so that only a predetermined period carries out sequential transmission of the RF signal by which said 1st [the], the 2nd, and the 3rd were modulated respectively and in which training according to claim 10 is possible.
[Claim 13] In the transmission-and-reception machine in which training for transmitting the modulated RF signal which has the code learned in order to learn the property of the received seizing signal containing RF carrier frequency and a code and to carry out remote actuation of the equipment is possible Two or more actuation switches with which it has so that it may operate by the crew of a car, and each corresponds to two or more different one of the channels, The memory for memorizing the data showing the property that each has two or more addressable storage areas relevant to one of said the channels, and the received seizing signal was identified, It is the control unit combined with said actuation switch, said memory, and said receiver. It goes into the training mode for channels as which the actuation switch corresponding to the selected channel was chosen following it when only the predetermined period operated. In said training mode Said control unit identifies RF carrier frequency and the code of RF seizing signal which were received. And the data showing RF carrier frequency from which received RF seizing signal was discriminated, and a code are memorized to the addressable storage area relevant to the channel as which said memory was chosen. Said control device goes into the transmitting mode for channels chosen following it when only the period when the actuation switch corresponding to the selected channel is shorter than said predetermined period operated. Said control device the data memorized in said transmitting mode from the storage area relevant to the channel as which it was chosen in said memory in which the address is possible Read-out, And the control unit which generates two or more frequency-control signals with which each expresses a different RF frequency relevant to RF carrier frequency as which the received seizing signal was specified from said memorized data, The learned code corresponding to each frequency-control signal which was combined with said control device,

and received a frequency-control signal and the memorized data showing a code, and was supplied by said control device, The transmission-and-reception machine which is characterized by having the transmitter which transmits two or more modulated RF control signals with which each has a different RF carrier frequency and in which training according to claim 10 is possible.
[Claim 14] In a transmitting mode, said control device generates the 1st, 2nd, and 3rd frequency control signals for the memorized data from read-out and the memorized data. Said 1st frequency control signal expresses the 1st frequency lower than identified RF carrier frequency. While said 2nd frequency control signal expresses the 2nd frequency equal to identified RF carrier frequency and said 3rd frequency control signal expresses the 3rd frequency higher than identified RF carrier frequency The RF signal by which the 1st which has the learned code by which said transmitter was modulated on the 1st frequency was modulated, The transmission-and-reception machine which is characterized by carrying out sequential generating of the RF signal by which the 2nd which has the learned code which was modulated on the 2nd frequency was modulated, and the RF signal by which the 3rd which has the learned code which was modulated on the 3rd frequency was modulated, and transmitting and in which training according to claim 13 is possible.
[Claim 15] It is the transmission-and-reception machine in which training according to claim 14 characterized by being higher than RF carrier frequency from which said 1st frequency was lower than RF carrier frequency from which the received seizing signal was discriminated 500kHz, and said 3rd frequency was discriminated 500kHz is possible.
[Claim 16] Said control unit is a transmission-and-reception machine which is characterized by said transmission-and-reception machine controlling said transmitter so that only a predetermined period carries out sequential transmission of the RF signal by which said 1st [the], the 2nd, and the 3rd were modulated respectively and in which training according to claim 14 is possible.

OPERATION

[Function] In order to attain the above and other advantages, it is embodied on these descriptions. According to the object of this invention indicated, the transmission-and-reception machine for cars of this invention which transmits the RF signal encoded for the remote start of equipment to a receiver It is combined with the actuation switch which it had so that the crew of a car might operate, and this actuation switch, and the signal generation equipment which carries out sequential generating of at least two control signals which have a different RF carrier frequency from the same code is included following actuation of an actuation switch. A transmitter may be a transmitter which can learn RF carrier frequency and the code of the received seizing signal and which can be trained. Suitably, signal generation equipment transmits two or more control signals. That is, one side is a signal which learned or is in predetermined RF carrier frequency, and another side is a signal which has RF carrier frequency which learned /predetermined RF carrier frequency isolated up and down.

EXAMPLE

[Example] The above of this invention and the other descriptions, the object, and an advantage will be understood by reading a claim and the following descriptions with reference to an accompanying drawing by the expert who carries out this invention.
[0013] Drawing 2 shows the transmission-and-reception machine 43 which can train this invention. The transmission-and-reception machine 43 which can be trained includes pushbutton switches 44, 46, and 47, the light emitting diode (LED) 48, the electrical circuit plate that may be mounted in housing 45, and the related circuit. Switches 44, 46, and 47 may support the equipment of the separate garage door by which each should be controlled, or others so that it may explain in full detail behind. As for the housing 45 of the transmission-and-reception machine which can be trained, it is desirable that it is the proper size which is mounted in the accessory of a car like the overhead console 50 as shown in drawing 1 . With the structure shown in drawing 1 , the transmission-and-reception machine 43 which can be trained contains the conductor for receiving the feed from the dc-battery of a car combined with the electric system of a car. The overhead console 50 contains the accessory of others like the lamp 52 for reading the map controlled by the switch 54. Furthermore, the electronic compass and the display (not shown) may be included.
[0014] the transmission-and-reception machine 43 which can be trained -- or it may be mounted in the accessory of a car like a visor 51 (drawing 3) or the reflector glass assembly 53 (drawing 4 R> 4) fixed. The transmission-and-reception machine 43 which can be trained is incorporated in a visor and a mirror, and although illustrated as what is arranged dismountable in the partition of an overhead console, the transmission-and-reception machine 43 which can be trained can also be arranged fixed or dismountable in the suitable location of the arbitration inside the instrument board of a car, or a car.
[0015] System-hardware drawing 5 shows roughly the electrical circuit of the transmission-and-reception machine 43 which can be trained with the block diagram. The transmission-and-reception machine 43 which can be trained contains the formal switch interface circuitry 49 conventionally to which each remaining terminal was connected with the end child of each push button switches 44, 46, and 47 combined with the ground. An interface circuitry 49 is combined with the input terminal 62 of the microcontroller 57 which is a part of transmission-and-reception machine circuit 55 which can train the signaling information from switches 44, 46, and 47. The power source 56 is combined with the various components of the transmission-and-reception machine circuit 55 in which training for being combined with the dc-battery 60 of a car, and usually supplying required power operated by the conventional approach through a connector 61 is possible. In addition to the microcontroller 57, the transmission-and-reception machine circuit 55 includes the radio frequency (RF) circuit 58 combined with the microcontroller 57 and the antenna 59.
[0016] as mentioned above, each switches 44, 46, and 47 may correspond respectively with different equipment like the control unit and others of RF frequency of operation with original each, a modulation technique and (or) a different garage door that may have the secrecy maintenance code, an electromotive inlet-port gate, and a house LGT which should be controlled. Thus, switches 44, 46, and 47 correspond with the radio frequency channel from which it differs for [which can be trained] the transmission-and-reception machines 43. If the switch (44, 46, 47) with which the transmission-and-reception machine 43 corresponds if it finishes being trained so that RF channel relevant to one of the switches 44, 46, and 47 may correspond with the RF seizing signal B transmitted from the pocket type remote transmitter 65 relevant to garage (for example) door disconnection equipment 66 is ******(ed), in order to start equipment like garage door disconnection equipment 66, the RF-signal T which has the same property as a seizing signal B will transmit. Thus, RF-signal T which has the property that RF-signal B required in order that the transmission-and-reception machine 43 may start equipment succeedingly like garage door disconnection equipment 66 was identified can be transmitted by being sent from the remote transmitter 65, and identifying and memorizing the carrier frequency of the received RF seizing signal B, a modulation technique, and data code. By pushing one to

which switches 44, 46, and 47 correspond, each RF channel may be trained so that it may correspond to RF-signal B which is different so that two or more equipments can be started besides garage door disconnection equipment 66. The household appliance of the arbitration of others which can receive auxiliary garage door disconnection equipment, the tonneau light of a building or an open-air lamp, a housing security system, or RF control signal may be contained in such other equipments.

[0017] The microcontroller 57 contains the data input terminal 62 for receiving the signal from the switch interface 49 in which the closeout condition of switches 44, 46, and 47 is shown. You may have additional input terminal 62a for receiving the serial connector terminal for receiving the downloaded information, another source like a voice bootstrap circuit, or the input data from the data input system of a car. The example of such a data input system for cars is indicated by handing out pan **** U.S. Pat. No. 5,555,172 "the user interface for controlling the accessory in a car and inputting data" on September 10, 1996. It has input terminal 62a in order for a user to receive the data directly inputted from a certain other sources. the mold of a programming command, the key of a code, and the remote transmitter 65 and (or) discernment of a model, or the cryptographic algorithm itself may be contained in such data.

[0018] The microcontroller 57 has the output terminal combined with LED48 which will be additionally turned on if one of the switches 44, 46, and 47 closes. If it goes into the training mode for one of RF channel relevant to switches 44, 46, and 47 in a circuit, LED48 will blink slowly, if training of a channel is successful, the light will be switched on quickly, and the microcontroller 57 is programmed to send a signal to LED so that it may blink slowly with a clear duplex flash, in order to urge him to re-operate a remote transmitter to an operator. Or in order to urge him for LED48 to direct it that training of a channel is successful, or to re-operate a remote transmitter to an operator, the multiple color LED from which a color changes is sufficient. LED48 is continuously turned on, in order to show that the transmission-and-reception machine has transmitted Signal T to a user by actuation of switches 44, 46, or 47 while the switch is pushed.

[0019] The microcontroller 57 may contain terminal 62b for combining with the display 64 which is indicated by aforementioned U.S. Pat. No. 5,555,172, in order to offer the user interface for urging performing actuation with a user during training of the transmission-and-reception machine which can further be trained, and actuation. For example, as long as a microcontroller 57 is required in order to synchronize the transmission-and-reception machine which can be trained with the receiver of the garage door disconnection system 66, you may display that the message to a user performs training or the send action of resynchronization. Furthermore, a microcontroller 57 may display the message which urges the transmitting switch of the remote transmitter 65 that it re-operates to a user, in order to judge whether the transmitting code was changed and to distinguish existence of an adjustable code. In addition, a microcontroller 57 may display a useful additional message on displaying the message which shows that training of the received signal was successful, and leading O ** RETA in process of a training procedure.

[0020] Drawing 6 shows the detail of the transmission-and-reception machine circuit 55 containing a microcontroller 57, the RF circuit 58, and an antenna 59. The microcontroller 57 may contain the integrated circuit of proper marketing like the MC6805P4 mold integrated circuit marketed from Motorola including nonvolatile storage (NVM) and a random access memory (RAM).

[0021] As for an antenna 59, it is desirable that it is the antenna containing the small loop antenna 70 which has the end child combined with the anode plate of 1st varactor diode 71a aligned dynamically, as for said 1st varactor diode, cathode is combined with the cathode of 2nd varactor diode 71b, and the anode plate of this 2nd varactor diode is combined with the ground. Varactor diodes 71a and 71b change the impedance characteristic of a loop antenna 70 according to the control voltage impressed between the cathode of varactor diodes 71a and 71b, and change the resonance frequency of the small loop antenna 70 by it. This control voltage is determined by the microcontroller 57 which sends an antenna control digitized output signal to input terminal 72' of digital one / analog (D/A) transducer 72 combined with the cathode of varactor diodes 71a and 71b. In order that a RF signal may raise to the maximum the

transmission and the receiving property of each specific frequency which are transmitted or received by using the antenna aligned dynamically, a microcontroller 57 is programmable to adjust the resonance frequency of an antenna 59 selectively.

[0022] thus, the electromagnetism by which, as for the antenna 59, the antenna 59 was received in the receive mode -- the effectiveness which changes a RF signal into an electrical signal, and the electromagnetism to which the antenna 59 was transmitted by the transmitting mode -- it can be made to align dynamically so that the effectiveness which emits a RF signal may become the maximum In addition, if an antenna 59 is dynamically aligned with the resonance frequency corresponding to the carrier frequency of a sending signal, an antenna 59 can remove an unnecessary harmonic from the signal transmitted. Thus, the antenna 59 which can be aligned achieves the function as a band-pass filter to have the adjustable center frequency corresponding to the transmitted carrier frequency. When a handset is in a car, in order to raise the transmission data length and sensibility of a handset using the advantage of the reflection property of a roof, it is desirable to arrange a loop antenna 70 vertically to the roof of a car. A microcontroller 57 mentions later the sun which controls an antenna 59 with reference to the flow chart shown in drawing 10 .

[0023] The RF circuit 58 containing a voltage controlled oscillator (VCO) 73 is combined with the antenna 59 for transmitting learned RF control signal, and this VCO has the control input terminal combined with the data output terminal of a microcontroller 57, in order to control the frequency outputted by VCO73. The detailed structure of VCO suitable for using it by this invention is shown in drawing 7 .

[0024] VCO73 contains two parts. That is, it is the LC resonator 104 which supplies a variable frequency resonance signal to the oscillator 103 which outputs the sinusoidal signal which can be modulated with ASK data, and an oscillator 103. The oscillator 103 contains the oscillation transistor 110 by which the collector was combined with the forward source electrical potential difference VEE, the base was combined with the 1st terminal of a capacitor 112, and the emitter was combined with the ground through the switching transistor 114. The base of the buffer transistor 116 is combined with the 2nd terminal of a capacitor 112, a collector is combined with the forward source electrical potential difference VEE, and the emitter is combined with the 1st terminal of a resistor 118. Said resistor has the 2nd terminal connected to the ground through the switching transistor 114. As a switching transistor 114 combines the emitter of transistors 110 and 116 with a ground selectively, the base of a switching transistor 114 is combined so that the ASK data from a microcontroller 57 may be received. Thus, a switching transistor 114 modulates a signal selectively by VCO output 73' supplied with the emitter of the buffer transistor 116.

[0025] The LC resonator 104 contains the 1st coupling capacitor 120, the terminal of one of these is combined with the base of the oscillation transistor 110, and the other end child is combined with the 1st terminal of an inductor 122. The end child of the 2nd coupling capacitor 124 is combined with the emitter of the oscillation transistor 110, and the other end child is combined with the cathode of the 1st and 2nd varactor diodes 126 and 128. The anode plate of the 1st varactor diode 126 is combined with an inductor 122 and the 1st terminal of the 1st coupling capacitor 120, and the anode plate of the 2nd varactor diode 128 is combined with the 2nd terminal of the inductor 122 combined with the ground. Varactor diodes 126 and 128 and an inductor 122 form the resonance LC circuit which has the adjustable resonance frequency changed by changing the electrical potential difference impressed to varactor diodes 126 and 128 through the resistor 130 combined with armature-voltage control terminal 73."

[0026] The RF circuit 58 contains the variable gain amplifier (VGA) 74 which has the input further combined with the output of VCO73 which supplies a signal to the input of the transmitting amplifier 77 through a coupled circuit 76. The output capacitor 78 is combined between the transmitting amplifier 77 and a loop antenna 70.

[0027] The RF circuit 58 also contains the capacitor 80 for combining a mixer 79 with an antenna 59 further. A buffer amplifier 81 has the input combined with the output of VCO73, and supplies a signal to one input of a mixer 79 from there. The remaining input terminals of a mixer 79 are combined with the capacitor 80 for receiving a signal from an antenna 59. The band-pass

filter 82 has the input combined in order to receive a signal from the output of a mixer 79, and the output combined with the input of amplifier 83. Preventing preferably all the signals of the others outputted from a mixer 79, the band-pass filter 82 has narrow band width of face and the center frequency of 3MHz, in order to pass the data signal which has a 3MHz signal component.
[0028] The output of an amplifier 83 is combined with the input of the integrator 84 which has the output combined with the data input terminal of a microcontroller 57. An integrator 84 integrates with the signal supplied from amplifier 83, in order to send the display to which removed the 3MHz frequency component from the signal, and the data code of a remote transmitter restored to a microcontroller 57, and it rectifies.
[0029] In addition, the RF circuit 58 includes the serial port and the control-logic circuit 75 which have the input terminal 75 combined with serial data address (solvent deasphalting) line 75' and serial control-logic (SCL) line 75." VCO output 73' is further combined also with the input of a buffer 91, and the output of this buffer is combined with the phase locked loop circuit 85. The criteria oscillator 86 containing Xtal has the 1st and the 2nd terminal which were combined ranging over amplifier 87 and combined with the comparison amplifier 88. Thus, the criteria oscillator 86 is combined with the clocked into and the phase locked loop circuit 85 of a control unit 57 in order to supply the reference signal compared with the signal outputted from VCO73.
[0030] The RF circuit 58 also contains the low-pass filter 89 which has the input terminal combined with output 85' of the phase locked loop circuit 85, in order to hold further the control voltage impressed to armature-voltage control terminal 73" of VCO73 through the armature-voltage control buffer 90.
[0031] VCO73 outputs the RF signal which has the frequency which can be adjusted by changing the electrical potential difference impressed to the armature-voltage control terminal 73." When the RF signal outputted from VCO73 is working at a transmitting mode, it becomes irregular by the amplitude-shift-keying (ASK) data supplied by the microcontroller 57. RF output signal with which VCO73 was modulated is supplied to VGA74. VGA74 answers the control signal sent out by the microcontroller 57 through SCL line 75" and solvent deasphalting line 75', and amplifies the modulated RF signal which was supplied from VCO73 in adjustable in proportion to the GAIN (gain) control signal supplied by a serial port and the logical circuit 75. VGA74 may shunt a current from the differential amplifier of a couple, and one differential amplifier to the differential amplifier of another side, and may carry out gain of VGA74 with the shunt of the digital control reduced selectively. The gain level of VGA74 becomes settled as a function of the duty factor of a signal and frequency which are going to be outputted from VCO73 so that it may explain to a detail further later.
[0032] The gain adjusted power of VGA74 is supplied to a coupled circuit 76, and this circuit filters the unnecessary harmonic from the RF signal outputted from VGA74. Preferably, the coupled circuit 76 contains the 22-ohm resistor combined with the 470pF capacitor and the serial. The output signal by which the coupled circuit 76 was filtered is sent to the transmitting amplifier 77 next, and this amplifies the filtered output to a proper transmission level. The output of the transmitting amplifier 77 is suitably supplied to an antenna 59 through the output capacitor 78 which has a 470pF KYABASHI wardrobe.
[0033] In order to reduce the output of the signal outputted from VCO with a comparatively high output, variable attenuator has been used until now. However, such a system tends to transmit the unnecessary harmonic component with the required seizing signal. Since the output energy level of such a harmonic component transmitted from the antenna 59 must be taken into consideration when calculating the output energy level permitted by the FCC guideline, it is desirable to remove a harmonic component from the RF signal outputted by VCO73. The transmitting amplitude of a required carrier frequency component may be so low that in other words the amplitude of the harmonic component outputted from an antenna 59 is large. Thus, the amplitude of the RF signal of the low-power output outputted from VCO73 is carried out, and by using VGA74 which filters, a coupled circuit 76, the transmitting amplifier 77, and the antenna 59 that can be aligned, in order to decrease the output RF signal with a comparatively high output from VCO, an advantage clearer than the sending circuit which used variable

attenuator is acquired.
[0034] It is generated by VCO73 and a mixer 79 mixes the RF signal received from the antenna 59 with the criteria RF signal supplied to a mixer 79 through a buffer 81. the carrier frequency of the RF signal received although the output of a mixer 79 expressed the received RF signal -- ** -- some signal components containing one component which has the carrier frequency equal to a difference with the frequency of RF reference signal generated by VCO73 are included. The output signal of a mixer 79 is impressed to the input of a band-pass filter 82, and only 3MHz is high, or it is more desirable [this band-pass filter] than the carrier frequency of the RF signal by which the frequency of RF reference signal in which the band-pass filter 82 was generated by VCO73 was received to have the narrow band width of face centering on the frequency of 3MHz so that the data signal encoded only when low may be outputted. Thus, the remaining signal component of the output of a mixer 79 is prevented with a band-pass filter 82. In order to supply the signal which has the same data code as the data code outputted from remote transmitter 65 drawing 5 , the output-data signal coded from the band-pass filter 82 is amplified by amplifier 83, and it integrates with it with an integrator 84.
[0035] In order to bar transmission of the signal in learning mode, serial port and control-logic circuit 75 drawing 6 controls a disable as VGA74 and the transmitting amplifier 77 by supplying the transmission-control signal TX as it is usable. Similarly, a serial port and the control-logic circuit 75 supply the reception-control signal RX, and this is supplied in order to make selectively a mixer 79, a receive buffer 81, amplifier 83, and an integrator 84 into usable and a disable, as shown in the usable input of the dotted line of drawing 6 .
[0036] Drawing 8 shows the electric schematic diagram of the example of a mixer 79, a band-pass filter 82, amplifier 83, and the integrator/rectifier 84. A mixer 79 receives the signal received from the antenna 59 through the input terminal 140, and the reference signal generated by VCO73 through the terminal 141. It is combined mutually and these two signals are sent to the base of a transistor 143 by the capacitor 142. The emitter of a transistor 143 is combined with a ground and the collector is combined with the base by the resistor 144. A capacitor 142 is a 56pF capacitor and, as for a resistor 144, it is desirable to have the resistance of 150Kohm. Input port 140 and 141 is suitably combined with the feed bus-bar 145 through the pull-up resistor machine 146 which has the resistance of 1Kohm. In order to receive the reception-control signal RX from a microcontroller 57, the electric power supply of the feed bus-bar 145 is selectively carried out to an electrical potential difference VEE by the transistor 182 by which the base is connected to the terminal 186. The resistor 184 of 2Kohm is preferably connected between the emitter of a transistor 182, and the base. The feed bus-bar 145 will be carried out by it by the electrical potential difference of +VEE, if the reception-control signal RX is received from a microcontroller 57. The feed bus-bar 145 is combined with the ground through two juxtaposition capacitors 156 and 166 which have the capacitance of 0.1 micro F preferably. As for the mixer 79, those all are further combined with juxtaposition between the feed bus-bar 145 and the output terminal 157 of a mixer 79 including the resistor 150, the capacitor 152, and the inductor 154. Said output is supplied from the collector of a transistor 143 through a resistor 148. A resistor 153 has the resistance of 7.5Kohm, a resistor 148 has the resistance of 4.3Kohm, and, as for an inductor 154, it is [a capacitor 152 has the capacitance of 180pF and] desirable to have the inductance of 15 microhenries. Although the specific suitable configuration is explained, a mixer 79 is easy to be the thing of the conventional configuration of arbitration, as long as a high-frequency RF signal is mixable.
[0037] Suitably, an end child is connected to the output terminal 157 of a mixer 79, and the band-pass filter 82 contains the coupling capacitor 158 connected to the output terminal 161 of the filter with which the other end child was connected to the ground by the inductor 160. Although other configurations may be used, a capacitor 158 is a 22pF capacitor and it is suitable for an inductor 160 to have the inductance of 15 microhenries so that it may become the bandwidth centering on 3MHz.
[0038] The output terminal 161 of a filter 82 is combined with the amplifier 83 by two series capacitors 162 and 164 which form the input of an amplifier 83. The amplifier 83 contains the transistor 168 which the base was combined with the joint with capacitors 162 and 164, and the

collector was further combined with the base through the resistor 170, and was combined also with the feed bus-bar 145 through the resistor 172. Furthermore, it is combined with the collector of a transistor 168 and, as for the amplifier 83, the end child contains the resistor 174 by which the remaining terminal was combined with the emitter of a transistor 168 by the capacitor 176. The joint 175 between a resistor 174 and a capacitor 176 is equipped with the output of an amplifier 83. A resistor 170 has the resistance of 39Kohm, a capacitor 162 has the capacitance of 150pF, and a resistor 174 has [a capacitor 164 has the capacitance of 180pF, / a resistor 172 has the resistance of 820Kohm, and] the resistance of 150Kohm, and, as for a capacitor 176, it is desirable to have the capacitance of 56pF. Although the specific suitable configuration of amplifier 83 was explained, it will be understood that other configurations may be used.

[0039] The integrator / rectifier 84 contains the capacitor 178 which was combined with the output joint 175 of amplifier 83 by the end, and was combined with the feed bus-bar 145 by the anode plate of diode 188 through the resistor 180 again by the other end. The integrator / rectifier 84 contains further the integrating capacitor 190 and resistor 192 which were connected to juxtaposition between the cathode of diode 188, and a ground. Furthermore, integrator Q / rectifier 84 contains the coupling capacitor 194 combined between diode 188 and an output terminal 196, in order to supply the output signal impressed to the data input port (the 6A drawing) of a microcontroller 57. A capacitor 190 has the capacitance of 180pf(s), a capacitor 178 has the capacitance of 2200pF and it is [a resistor 180 has the resistance of 56Kohm and / a resistor 192 has 1M ohm resistance, and] desirable [a capacitor 194] to have the capacitance of 1 micro F. Since another configuration may be used, the specific suitable configuration of the integrator / rectifier 84 explained so far is the instantiation object.

[0040] It has the data format as the RF seizing signal B transmitted by the remote transmitter 65 also with the same data signal outputted from the integrator 84 which is generally amplitude-shift-keying (ASK) data. The ASK data output outputted from the integrator 84 is supplied to a microcontroller 57 for the further processing and storage. A microcontroller 57 processes this ASK data, and explains to a detail the mode which memorizes and controls a RF signal by the following after explanation of the part of the RF circuit 58 which supplies an armature-voltage control signal to VCO73.

[0041] The part of the RF circuit 58 which supplies an armature-voltage control signal to VCO73 contains the phase locked loop circuit 85, the criteria oscillator 86, an amplifier 87, the comparison amplifier 88, the low-pass filter 89, the armature-voltage control buffer 90, and the VCO output buffer 91. The mode of this part of the RF circuit 58 of operation is explained with reference to drawing 9 which showed the detailed configuration of the phase locked loop circuit 85. The phase locked loop circuit 85 contains R division register 92 which has the input combined with the 2nd terminal of the criteria oscillator 86. N division register 93 has the input combined with the VCO output buffer 91. The output of registers 92 and 93 is combined with the input terminal of the phase / frequency detector 94 which has the output combined with the input of the control-logic circuit 95. On the other hand, the control-logic circuit 95 has the terminal of the couple combined with the input of the receiving side / source switching circuit 98 which has the output terminal combined with the low-pass filter 89. As for a low-pass filter 89, it is desirable to have the 0.1 micro F capacitor connected to the 560 ohms resistor combined with the output of the phase locked loop circuit 85, a 560-ohm resistor, and juxtaposition and the 1.2-micro F capacitor.

[0042] The main objects of the phase locked loop circuit 85 are controlling the electrical potential difference impressed to the armature-voltage control terminal of VCO73, as the frequency of the RF signal outputted by VCO73 in the frequency of the RF signal outputted by VCO73 as compared with the frequency of the criteria oscillator 86 has the frequency of the criteria oscillator 86, and predetermined relation. The predetermined relation between frequencies of each above-mentioned signal is the ratio of two variables R and N supplied to R division register 92 and N division resistor 93 from a microcontroller 57 through a serial port and the control-logic circuit 75, respectively. The relation between the frequency fVCO of the RF signal outputted by VCO73 and the frequency fREF of the signal outputted with the criteria

oscillator 86 may be expressed as follows mathematically.

$$f_{VCO} = \frac{N}{R} f_{REF}$$

However, fREF is a constant about the value of 4MHz. Thus, when fREF=4MHz and R= 4 are used, it is N about a frequency fVCO. It is equally [to MHz] controllable. If the value of N becomes large when the constant of fREF and R is kept constant, a frequency fVCO will increase according to it. If the value of R is enlarged, a frequency fVCO is more controllable to a precision. On the other hand, the range where fVCO can operate becomes large, so that the value of R is small. Suitably, as for the value of R and N, being supplied as 8-bit data is desirable.

[0043] The output of R division register 92 and N division register 93 is sent to a phase / frequency detector 94, and this supplies the output pulse corresponding to a delta frequency as compared with the frequency outputted from R division register 92 in the signal outputted from N division register 93. a phase / frequency detector 94 is easy to be ****** by the approach of the conventional arbitration. When each above-mentioned frequency is the same, a phase / frequency detector 94 outputs a pulse-ized control signal to a receiving side / source switching circuit 98, and it is made for both switches 99 and 100 to stop at an open condition. When the switches 99 and 100 as which a solid state switch like CMOS or a bipolar form transistor is sufficient have stopped at the open condition as for both sides, the electrical potential difference impressed to the armature-voltage control terminal of VCO73 is kept constant by the buffer 90, and an electrical potential difference is accumulated by the capacitor in a low-pass filter 89.
[0044] When the frequency of the signal outputted from N division register 93 is lower than the frequency of the signal outputted from R division register 92, a phase / frequency detector 94 supplies a pulse-ized control signal to switches 99 and 100, and it is made, as for closing and a switch 100, for a switch 99 to stop at an open condition. If a switch 99 closes, the electrical potential difference on which the electrical potential difference VCC of 5 volts is impressed to the capacitor of a low-pass filter 89, and is impressed to the armature-voltage control terminal of VCO73 by it, for example will rise. When the electrical potential difference in the armature-voltage control terminal of VCO73 rises, the frequency of the signal which the frequency of the output RF signal increases, as a result is outputted by N ******** REBISUTA 93 increases. When the frequency of the signal outputted from R division register 92 and N division register 93 is the same, as for a phase / frequency detector 94, a control signal is sent to switches 99 and 100, a switch 99 is maintained at an aperture and a switch 100 is maintained at an open condition.
[0045] When the frequency of the signal outputted from N division register 93 is higher than the frequency of the signal outputted from R division register 92, a control signal is outputted to switches 99 and 100, a switch 99 stops at an open condition, and a switch 100 closes a phase / frequency detector 94. If a switch 100 closes, it will connect with a ground, as a result the capacitor in a low-pass filter 89 will discharge. Reducing the electrical potential difference impressed to the armature-voltage control terminal of VCO73 by discharge of the capacitor in a low-pass filter 89, VCO73 reduces the frequency of an output RF signal by it. Thus, the output signal from N division register 93 is reduced until it judges with what has the the same frequency of the signal with which the phase / frequency detector 94 was outputted from R division register 92 and N division register 93.
[0046] It has the control-logic circuit 95 in order to respond to the logical level of the ASK data read from the memory of a microcontroller 57 into the transmitting mode and to connect and intercept a phase / frequency detector 94 selectively from a receiving side / source switching circuit 98. Among a transmitting mode, a microcontroller 57 makes VCO73 usable and a disable about the selected channel using the ASK data memorized in memory, in order to modulate ASK data to the subcarrier RF signal generated by VCO73 in order to transmit the learned data code. If VCO73 is made into activity impossible with ASK data, the frequency of the output signal from

VCO73 detected by the phase locked loop circuit 85 will descend to zero. When it does not have the proper means in the phase ROMAKU loop-formation circuit 85, the phase / frequency detector 94 will control the receiving side / source switching circuit 98 so that the frequency control voltage impressed to VCO73 rises substantially, if VCO73 is made into a disable. Then, VCO73 will start transmission of the carrier frequency which is in - quantity rather than a desired frequency for the first time, after being made usable. In order to prevent that the phase locked loop circuit 85 raises the frequency of VCO73 remarkably between disable conditions, when ASK data are in the level which makes VCO73 a disable, in order to intercept a phase / frequency detector 94 selectively from a receiving side / source switch 98, it has the control-logic circuit 95.

[0047] It continues at the disable of VCO73, and the ASK data read from the memory of a microcontroller 57 into the transmitting mode in order to maintain the phase relation of the signal outputted from R division register 92 and N division register 93 are supplied in order that this may also make usable and a disable R division register 92 and R division register 93 with an ASK data signal synchronizing with VCO73 made into usable and a disable.

[0048] It is suitable for the RF circuit 58 to incorporate to the integrated circuit (ASIC) 101 peculiar to application manufactured using the existing integrated-circuit technique. In the suitable example shown in drawing 6 , it has the following component on the substrate 102 of ASIC101. That is, they are VGA74, a mixer 79, a receive buffer 81, amplifier 83, an integrator 84, the phase locked loop circuit 85, amplifier 87, a comparator 88, the armature-voltage control buffer 90, and the oscillating section 103 of VCO73. A coupled circuit 75, the transmitting amplifier 77, the output capacitor 78, the input capacitor 80, a band-pass filter 82, the criteria oscillator 86, a low-pass filter 89, and LC resonance section 104 of VCO73 are not illustrated as what is included in ASIC101, in order to avoid including a comparatively large capacitor in a substrate 102. being also alike -- it cannot be involved but these components can be included in ASIC101.

[0049] Although the electrical circuit component of the handset circuit 55 has so far [system behavior] been explained, the mode by which a microcontroller 57 controls the handset circuit 55 here with reference to drawing 10 - drawing 11 , drawing 12 - drawing 18 , drawing 19 , drawing 20 - drawing 21 , drawing 22 , and drawing 23 is explained. In drawing 12 - drawing 18 , it is shown to the shift port of a flow chart by the alphabetic character which attached the figure of an option behind. Reference characters are the alphabetic character parts of the drawing number below drawing 12 . For example, the shift port which attached the alphabetic character of C shows that a process shifts to the shift inlet-port port which attached the alphabetic character of C of drawing 14 . The figure of the option attached after reference characters shows one of two or more of the inlet ports to the process shown in the drawing corresponding to reference characters. For example, it is shown that the shift port which attached the sign of E1 shifts to the process shown in drawing 16 in the shift inlet-port port which attached the sign of E1.

[0050] As shown in block 200 (drawing 10), actuation of one of the push button switches 44, 46, and 47 starts actuation. If it is detected that one of the switches 44, 46, and 47 was pushed, a microcontroller 57 will receive a signal through an interface 49 (drawing 5), and as shown in BUSUKKU 201, it will initialize the port and random access memory (RAM). Next, a program puts a timer (block 202) into operation for 20 seconds, and reads the channel corresponding to the pushed switches 44, 46, and 47. Next, the channel as which the program for microcontroller 57 was chosen judges whether it is already trained (block 204). When the selected channel precedes and is trained, a microcontroller 57 downloads the data relevant to the selected channel to RAM (block 205), the frequency outputted by the gain and VCO73 of VGA74 is set up, and ANTERO 59 is aligned according to the data relevant to the selected channel (block 206). A microcontroller 57 sets up the gain of VCO73 by sending the proper output signal showing the value of R and N to R division register 92 and N division register 93 through a serial port and the control-logic circuit 75.

[0051] By sending a control signal to a serial port and a control circuit 75 through SCL and a solvent deasphalting line, a microcontroller 57 sets up the gain of VGA74. The GAIN control

signal sent to the gain control input of VGA74 consists of a value of 5 bits, and is [therefore] easy to bring about the possible gain level of 32. Since the command of FCC permits a different output level based on the duty factor of the transmitted signal, as for the handset which can be trained, it is advantageous that the gain of the transmitted signal can be adjusted dynamically. Therefore, a handset 43 can be transmitted by having much possible gain level with each different frequency and the encoded greatest output level which it transmits and which is permitted for every signal.

[0052] In order to make proper gain level the optimal for every transmitted predetermined seizing signal, a microcontroller 57 examines the frequency of the signal transmitted first, and judges the relative output. Each of the possible gain level of 32 corresponds to the integer from which it differs between 0 and 32, and a microcontroller 57 chooses early gain level based on the frequency of the signal transmitted as what expresses the gain control of min [32] again for the gain control of max [0]. For example, a microcontroller 57 may choose the initial gain level 5 as signals with a powerful output, and may choose the initial gain level 0 as signals with a comparatively weak output. Next, a microcontroller 57 counts the measurement size of a code with high ejection and logical level for the total predetermined measurement size of the code within a predetermined period, computes that product by the counted logical level carrying out the multiplication of the high measurement size by the predetermined constant, and judges the duty factor of a code by doing the division of this product with a total predetermined measurement size. A microcontroller 57 adjusts the selected initial gain level based on a duty factor. For example, when initial gain level is 5, a microcontroller 57 adjusts gain level to the level between 5 and 32, in that case, the minimum gain level (32) is equivalent to the highest duty factor, and the highest gain level (5) which does not exceed initial gain level is equivalent to the minimum gain level. A microcontroller 57 may choose gain level based on the judgment of the slow speed of data code further. The example of the mode which judges the duty factor of a code signal and chooses an output level based on the duty factor and frequency of a signal which are transmitted is indicated by U.S. Pat. No. 5,442,340. The mode a microcontroller 57 judges the slow speed of the data code with which the received seizing signal is equipped to be is explained below.

[0053] Being able to change the gain of VGA74 between 15dB and 20dB suitably, the transmitting amplifier 77 has 25dB gain suitably. VGA74 and the transmitting amplifier 77 bring about 10dB adjustable gain by collaboration. Suitably, the output of a handset 43 is between 0 and 5dbm(s).

[0054] A microcontroller 57 is aligned in an antenna 59 by supplying antenna control data to D/A converter 72. The 8-bit value relevant to the various frequencies which antenna control data have the 8-bit value suitably, and may calculate this from the frequency of VCO73, or may be outputted from VCO73 may be read from a table including a list. Generally, the voltage output from D/A converter 72 is controlled to change from 0.5 to 4.5V linearly to a 220 to 440MHz frequency range. Thus, each increment of the 8-bit value supplied by the microcontroller 57 expresses about 15.6mV increment of the output voltage of D/A converter 72. 8-bit antenna control data may be calculated from frequency data, after preceding and memorizing in relation to the selected channel or reading data from memory. The capacitance of varactor diodes 71a and 71b changes under inverse proportion linearly with the electrical potential difference impressed to the cathode. For example, varactor diodes 71a and 71b have the capacitance of 14pF, when applied voltage is 0.5V, and when applied voltage is 4.5V, they are easy to have the capacitance of 2.4pF. Thus, it can be made to align so that it may have the carrier frequency of the signal transmitted or received so that RF sending signal which the minor loop antenna 70 for transmission and reception which has narrow band width of face comparatively received RF seizing signal from a remote transmitter to validity more, and was sent from the transmitting amplifier 76 in the signal might be emitted, and the resonance frequency to adjust. The handset circuit 55 which can be trained holds the impedance by which the antenna 59 was adjusted, and the output impedance of the RF circuit 58 by aligning an antenna 59 dynamically and having the capacity to change the gain of the output signal impressed to the cathode of varactor diodes 71a and 71b through the output capacitor 78.

[0055] As shown in block 206, after setting up the gain of VGA74, the frequency of VCO73, and alignment of an antenna 59, the code for channels as which the microcontroller 57 was chosen judges whether it is a fixed code or it is an adjustable code (block 207). This judgment may be performed based on setting out of a flag, when a seizing signal is learned. When a code is a fixed code, a microcontroller 57 modulates the RF signal generated by VCO73 a disable and by making it usable by ASK data in VCO73 as putting the data code relevant to the selected channel memorized in memory on read-out (block 208), and putting this ASK data on VCO73 and the phase locked loop circuit 85 (block 210). On the other hand, when a code is an adjustable code, a microcontroller 57 reads the data memorized for [which identifies the consecutive number of proper cryptographic algorithm, a code (when it exists) key, and the code transmitted to the last / selected] channels. Next, since a microcontroller 57 generates the code of the schedule transmitted to the receiver of a garage door disconnection device, that they are NVM or nonvolatile storage perform identified cryptographic algorithm memorizable in another desirable memory of some kind (block 209). When an adjustable code is a real-time code, a microcontroller 57 can read time amount in the clock of the interior or the exterior, in order to determine the proper code which should be transmitted according to time amount in the mode specified by cryptographic algorithm. In order to operate a garage door, when one or more transmitters can be used, the microcontroller 57 also contains ID tag in the generated code which is specified as a transmitter with which the seizing signal learned from there the handset which can be trained.
[0056] It is ordered a microcontroller 57 so that transmission of RF output signal with which VCO73 was modulated in the code which should be transmitted as shown in block 210 generating or after reading may be possible, and a sending signal TX may be outputted to VGA74 and the transmitting amplifier 77 to a serial port and the control-logic circuit 75.
[0057] The transmitting procedure roughly shown in the drawing 10 lock 210 is shown in the detail at drawing 11 . A transmitting procedure is setting it as the frequency in which the microcontroller's 57 isolated the frequency of VCO73 from the fundamental frequency F with which only the learned isolation frequency **F not more than fundamental-frequency F0 was learned, and is started with block 211. Next, the code in which only the predetermined period as shown in block 213, before a microcontroller 57 changes the frequency of VCO73 into fundamental frequency F0 at block 212 was learned is transmitted on this frequency. Before it raises a frequency (block 215) and only a predetermined period transmits it on this raised frequency, only the same predetermined period transmits only an amount with a microcontroller 57 equal to isolation frequency **F with (block 216) and fundamental frequency (block 214). Isolation frequency **F shall be chosen as an expert so that it may be isolated from the fundamental frequency in the receiving bandwidth of the equipment which receives the transmitted signal, so that clearly. As for isolation frequency **F, it is desirable that it is fully large although change of a transmission pattern is produced in order to remove the null which still remains in the bandwidth of a receiver. It is desirable that isolation frequency **F is 500kHz about the receiver of common garage door disconnection equipment. As for the predetermined period when a signal is transmitted on a frequency which is different with blocks 212, 214, and 216, it is desirable that they are 1 / 2 seconds. drawing 10 R> 0 -- a transmitting procedure is repeated at intervals of 20 seconds so that clearly. Thus, the procedure which carried out drawing 11 is repeatedly repeated until a timer is completed for 20 seconds.
[0058] More than the learned carrier frequency, by transmitting on the following and the frequency from which the plurality containing the frequency differs, the null in a transmission pattern can be made into the minimum, and the scope of a transmitter covering all transmitting include angles can be extended. **24** -- as for the transmission pattern 1 relevant to the learned basic carrier frequency which is transmitted, many nulls 2 are included in a large number like. By transmitting two additional signals which have the frequency which the learned basic carrier frequency isolated up and down from the transmitter 7 in a car 6, as shown in the examples 3 and 4 of a transmission pattern relevant to these two signals transmitted additionally, the effect of such a null 2 can be suppressed to the minimum.
[0059] While performing the above-mentioned step, it judges whether the microcontroller 57 supervised the timer for 20 seconds, and the pushed push button switch continues only the

period for 20 seconds, and continue being pushed (block 217, drawing 10 R> 0). When the period of a second has not passed, a microcontroller 57 continues (block 210) transmitting the RF signal relevant to the selected channel. A microcontroller 57 will start the training procedure in which a microcontroller 57 starts with block 218 (drawing 12), if it judges that only the period for 20 seconds continued being pushed continuously, or if the switch on which the microcontroller 57 was pushed with block 217 judges that the channel relevant to the switch on which it was pushed with block 204 is not yet trained. Before explaining the detailed procedure performed by the microcontroller 57 by training mode, a fundamental outline is indicated below.
[0060] It searches for whether received data exist in the RF sending signal B (drawing 5) which a microcontroller 57 is received by delivery (drawing 6) and the antenna 59 in the phase locked loop circuit 85 in the frequency-control data showing the value of R and N about an early frequency, and is processed by a mixer 79, a band-pass filter 82, and amplifier 83, and is sent to a microcontroller 57 from an integrator 84 during a training procedure. If frequency-control data are received, the phase locked loop circuit 85 will impress a frequency-control electrical potential difference to the frequency-control terminal of VCO73. VCO73 generates the reference signal which has the reference frequency corresponding to a frequency control electrical potential difference, and sends this reference signal to a mixer 79. When it has the carrier frequency of the RF seizing signal B which the reference signal received, and a predetermined relation, an integrator 84 sends the code signal of the received seizing signal to a microcontroller 57. In the suitable real example, when the difference of reference frequency and the carrier frequency of the received seizing signal is 3MHz, said predetermined relation exists.
[0061] When a microcontroller 57 does not receive the code signal for initial frequencies from an integrator 84, a microcontroller 57 chooses another frequency by the following loop formation, and sends a new frequency and corresponding frequency control data to a phase locked loop circuit. A code signal is detected, and a microcontroller 57 continues choosing a new frequency as mentioned above until that is directed by the signal from an integrator 84. A microcontroller 57 is judged to be that in which data exist, when existence of a code signal is checked using a check routine, and this check routine counts the number of rye JINGU edges which appears to the signal of the arbitration which received from the integrator 84 during the predetermined period and the number of rye JINGU edges exceeds a threshold level. A check subroutine is explained in full detail behind.
[0062] If a code signal with desirable appearing when lower 3MHz than the carrier frequency of the seizing signal which reference frequency received is detected, a microcontroller 57 will memorize the frequency-control data corresponding to the carrier frequency of the received seizing signal, and will make only 3MHz of reference frequency high. Ideally, a code signal should be extinguished on this frequency. However, in order to judge whether the code signal detected on that it is only the noise that may originate in the code signal with which a microcontroller 57 is detected on a frequency with a code signal low 3MHz when a code signal is not extinguished on this frequency, or this frequency is a thing more than a mere noise, a microcontroller tries to encode the code signal still received on this frequency.
[0063] By trying to encode a code signal, since a microcontroller 57 judges whether a code signal suits, it can test a strict code signal. In order that an attempt and this subroutine may identify that modulation technique further in order that a microcontroller 57 may encode a code signal using an ENCODE subroutine, chord progression is analyzed, and chord progression is memorized in memory for the modulation technique of the identified code signal using the optimal coding technique so that it may explain to a detail by the following. When a coding subroutine can identify the modulation technique of a code signal and a code signal can be memorized, it is considered that the attempt which encodes a code signal is what was successful.
[0064] When a code signal is received on the raised above-mentioned frequency corresponding to the frequency of the received seizing signal, a microcontroller 57 is judged to be what the code signal received on the both sides of an initial frequency and the frequency which rose does not suit. It is because the suiting code signal cannot encode on two frequencies isolated 3MHz based on the data on an experience. If it judges that the code signal in this frequency does not

suit, the program performed by the microcontroller 57 will repeat the above-mentioned process until it chooses a new frequency and the suiting code signal is detected.
[0065] When the code signal with which a code signal is not detected on a frequency with a code signal higher 3MHz than the frequency detected first and which cannot be case [a signal] or encoded is detected, a microcontroller 57 raises a frequency and searches only for 3 moreMHz of code signals. Ideally, the code signal extinguished on the frequency till then re-appears on this raised frequency. That is because the component of the delta frequency which was outputted from the mixer 79 unlike transmit frequencies B only 3MHz passes a band-pass filter 82. When a code signal re-appears, a microcontroller 57 changes reference frequency into the frequency (namely, frequency lower 3MHz than the frequency of a seizing signal B) on which the code signal was detected first, and encodes and memorizes a code signal. Generally, a microcontroller 57 memorizes a code signal by sampling a signal at a comparatively high rate of extractability like one sample every 68 microseconds. Different extractability based on the property that the code format of the received code signal was detected may be chosen as a different code signal. Thus, a microcontroller 57 may reproduce a code signal in a transmitting mode by reading from memory the code signal remembered that this memorized the code signal by the same extractability. Or the data which may memorize the data with which a logic state expresses many continuation samples of a low code signal highly, or express the periodicity in a specific data frequency may be memorized. In order to carry out the double check of the compatibility of the received code signal, when a microcontroller 57 sets up a DATPREV flag, and chooses return and a new higher frequency as the beginning of a training procedure suitably and a code signal is not detected on this new frequency, it checks that the code signal detected before suits.
[0066] In order to judge whether the received code is an adjustable code, a microcontroller 57 may confirm whether the specified frequency is a frequency used with a time amount change code. In addition, since an adjustable code can have the higher number of bits, a microcontroller 57 identifies an adjustable code based on the pulse number in a code. In order to check existence of an adjustable code, a microcontroller 57 re-operates the transmitting carbon button of a remote transmitter to a user, and you may make it urge that it checks whether the code contained in the 2nd sending signal is the same as the code of the 1st signal. Or a code may change dynamically by actuation of the once of the transmitting carbon button of a remote transmitter, or the property of a pulse itself may direct that a code is an adjustable code. In this case, a microcontroller 57 can judge that the received code is an adjustable code.
[0067] when the code within an active signal is an adjustable code, a microcontroller 57 examines the property (namely, the number of bits in a code, pulse width, pulse repeatability, and (or) a carrier frequency) of a seizing signal next, and identifies the format and model of a remote transmitter. By identifying the format and model of a remote transmitter, a microcontroller 57 can identify the cryptographic algorithm which the remote transmitter and the receiver relevant to this use next, and the cryptographic algorithm memorized by beforehand [corresponding], and can be accessed at this. Next, he is urged for a microcontroller 57 to perform a certain special procedure for the resynchronization of a system to a user. The procedure which a user urges to a remote transmitter that a resynchronization signal is transmitted is sufficient as this, or in order to receive and carry out resynchronization of the signal transmitted to a degree, the procedure of pushing the carbon button of the receiver of a garage door disconnection device is sufficient as it. When the procedure in which a transmitter transmits a resynchronization signal is included, sequential training of the transmission-and-reception machine which can be trained can be carried out so that a resynchronization signal may be learned and broadcast again.
[0068] When a code key is required, a microcontroller 57 determines the format that the remote transmitter was identified, and the proper method of receiving a code key based on a model as the identified cryptographic algorithm. It is because such an approach changes with manufacturers. the case where a code key may be downloaded or transmitted from a remote transmitter -- a microcontroller 57 -- a user -- receiving -- proper actuation -- ****** -- it urges like. When the receiver includes a certain device in which the code key is changed into the code key generated at random or in hand control, a microcontroller 57 generates a code key at random, and can transmit the key to a receiver. When a code key must be inputted in hand

control, a microcontroller 57 may receive such information from the data input system or voice actuation circuit of a car through input terminal 62a. Although the fundamental procedure of a training procedure was explained, more detailed explanation is indicated below with reference to drawing 1212 - drawing 18 , drawing 19 , drawing 20 , drawing 21 , drawing 22 , and drawing 23 .
[0069] A microcontroller 57 jumps over the frequency expressed by the frequency control signal sent to VCO73 to the highest frequency (for example, 400MHz) of a frequency band from the lowest frequency in the frequency band of this ** (for example, 200MHz), and starts the training procedure in (block 219) and the block 218 (drawing 12) of a program by pursuing detection of the code simultaneously received during such rapid shift. Since there is the response time in VCO73, the output frequency of VCO73 answers a jump of a frequency, and does not change from the minimum to the highest frequency momentarily. That is not right and an output changes from the minimum to the highest frequency continuously gradually. In order to receive a signal during a training procedure, when the antenna which can be aligned dynamically is being used, a microcontroller 57 is block 218 and jumps over the frequency with which an antenna 59 is aligned from the highest simultaneously to the minimum frequency. A microcontroller 57 makes the frequency of the output change continuously between the highest frequencies from the minimum frequency in the frequency range where VCO73 is desirable, as shown in block 220, unless it repeats a high-frequency control signal and a low frequency control signal to frequency control terminal 73' and delivery and a code are detected by turns earlier than it.
[0070] In VCO73 explained in full detail with reference to drawing 7 , the response times which change to the 2nd frequency which is 400MHz from the 1st frequency whose response time is 200MHz are about 5 mses. Thus, the frequency of VCO can carry out the sweep of the frequency range of this ** continuously many times repeatedly through the general duration of the signal transmitted from the transmitter of garage door disconnection equipment. Since the response time of almost all mixers is almost momentary as compared with the response time of VCO73, a mixer 79 outputs the signal component containing one signal component which has a carrier frequency equal to a difference with the reference signal outputted to the specific flash one by one from the carrier frequency and VCO73 of the RF signal which received. Since the frequency of VCO73 changes gradually during a jump of a frequency, whenever 3MHz of frequencies of VCO differs from the carrier frequency of the RF signal which the arbitration in the frequency band of this ** received, a pulse is outputted from a band-pass filter 82. The pulse outputted from the band-pass filter 82 is detected by the microcontroller 57. When such a pulse is not detected during this 2nd period, a microcontroller 57 ends a training procedure, and it stands by until it returns to that default mode and a carbon button is pushed again. On the other hand, when a pulse is detected during the jump by the highest frequency [minimum], a training procedure is continued as shown in block 221.
[0071] Thus, when a signal is received from the original transmitter and it is in a predetermined frequency band, existence of this signal is detected immediately, and a training procedure is continued also while reporting the purport by which the transmitter signal of effective origin is received when a microcontroller 57 starts an indicator circuit to a user (for example, initiation of the flash which LED48 of drawing 5 carried out slowly). Furthermore, since LED48 disappears and a training procedure is completed when an effective signal is not received, a user gets to know that effective data were not received after 10 seconds.
[0072] Only in order to indicate that an effective signal is under reception to a user, it becomes unnecessary thus, to carry out the sweep of each frequency in the comparatively large frequency band of this ** individually slowly by jumping over the frequency of VCO73 and aligning an antenna 59. Therefore, time amount required to carry out the sweep of each frequency first for this object is saved substantially, and it is mostly fed back to a user from an indicator in an instant that an effective signal is under reception.
[0073] If a signal is detected as shown in block 219, a training procedure will be continued with block 221 and a microcontroller 57 will search the frequency-control data showing a frequency lower 3MHz than the first frequency in the frequency list memorized by (block 221) and beforehand of R and N by carrying out clear [of the X register]. Suitably, the frequency list contains the clock frequency of the common knowledge of a garage door transmitter which

transmits only the period (namely, about 2 seconds) first limited like the conventional Canada style garage door transmitter with the value which carries out an increment. In a frequency list, the frequency on which it is known that the garage door transmitter of other marketing will operate after the frequency of a transmitter with such a short duration after that continues. The frequency relevant to a transmitter with a short duration is first memorized for raising possibility that training will be successful in the frequency list, before a transmitter with such a short duration suspends transmission of the RF seizing signal. When it does not have the frequency RF seizing signal transmitted by the garage door transmitter is remembered to be in the frequency list, the transmission-and-reception machine 43 which can be trained carries out the increment of the first frequency at intervals of 1MHz until the frequency of received RF seizing signal is specified.

[0074] A microcontroller 57 is aligned with the frequency which had the antenna 59 searched, and the frequency to adjust after searching a frequency utilizable for the beginning or a degree in a frequency list (block 222). In addition, a microcontroller 57 carries out clear [of the mode preservation (MODSV) register]. Next, by giving the proper value of R and N to R division register 92 and N division register 93, a microcontroller 57 is set to reference frequency lower 3MHz than the frequency which had the frequency of the signal generated by VCO73 searched, and outputs an input signal RX to a serial port and the control-logic circuit 75, and it orders it it so that a receive buffer 81, a mixer 79, a head amplifier 83, and integrator 84 may be made usable.

[0075] Next, a microcontroller 57 outputs the signal which blinks LED48, in order to report what the remote garage door transmitter 65 trained so that the transmission-and-reception machine 43 which can be trained may correspond to it should be started for to the operator who pushed one of the switches 44, 46, and 47. Then, an antenna 59 receives RF seizing signal transmitted by the remote transmitter 65, and sends the received signal to a mixer 79. The received RF signal is mixed with the signal outputted from VCO73 with this mixer 79. It is higher than the frequency of RF seizing signal which the frequency of the signal outputted by VCO73 received 3MHz, or when low, a microcontroller 57 calls the "VERIFY (check)" subroutine, in order that the ASK data contained in received RF seizing signal may be detected, existence of an effective-data code signal may be checked (block 223) and data code may identify "rapid" data or "slow speed" data.

[0076] Rapid data are detected when data have five or more rye JINGU edges within the period for 850 microseconds. Although data have five or a rye JINGU edge below it within the period for 850 microseconds, slow speed data are detected when five or more rye JINGU edges are detected within the period for 70 m seconds. The data of a fundamental class of two classes, i.e., the GENIE data transmitted from the transmitter of a GENIE brand, and non-GENIE (single tone) data are contained in rapid data. GENIE data and non-GENIE data are distinguished by the ENCODE subroutine explained below. GENIE data have the difference between GENIE data and the data transmitted by the remote garage door transmitter of another brand in it being frequency-sfift-keying data which have 10kHz and the pulse repetition rate deviated among 20KHZ(s). GENIE data are transmitted with the carrier frequency which is generally between 290MHz and 320MHz at intervals of 5MHz. The mode which a microcontroller 57 checks and memorizes data succeedingly, and encodes [of quickness, slow speed, and GENIE, i.e., single tone data,] by whether data are classified either is influenced so that it may become clear from the following explanation.

[0077] A VERIFY subroutine is shown in drawing 19 , it is started with block 224, and a microcontroller 57 starts a timer for 850 microseconds at this event. With blocks 226 and 228, a microcontroller 57 counts the rye JINGU edge of the ASK data within the period for 850 microseconds measured by the timer. With block 230, a microcontroller 57 judges whether the detected number of rye JINGU edges is five or more. When the number of rye JINGU edges is five or more A microcontroller 57 sets a data process response (DACK) flag as "1." It is shown that data were checked and a mode bit is set as "1." It is shown that data are rapid data (block 232), and a MODSV register is updated in order that a microcontroller 57 may memorize the value of a mode bit to block 234 (the 9A drawing) return and there.

[0078] When the program of a microcontroller judges with the number of the detected rye JINGU edges not being five or more with block 230, a program progresses to block 236 and a timer puts it into operation for 70 m seconds there. With blocks 238 and 240, a program counts the number of rye JINGU edges detected during the period for 70 m seconds. When the number of rye JINGU edges is five or more, a DACK flag is set as (block 242), a program is set as "1", a mode bit is set as "0" (block 244), it is shown that data are slow speed data, and it returns to the block which finally called the VERIFY subroutine. When it judges with the number of rye JINGU KAJJI with which the microcontroller 57 was detected during the period for 70 m seconds being less than five, a program sets a DACK flag as "0", shows that ASK data are not checked, sets a mode bit as "0", and returns to the block which continues after the block which called the VERIFY subroutine at the end as shown in block 246.
[0079] If drawing 12 is referred to again, after returning from a VERIFY subroutine and updating a MODSV register, it judges whether a program checks a DACK flag and the checked ASK data exist (block 248). When data do not exist, a program progresses to block 250 and the increment of the X counter is carried out there. Next, it judges whether X counter of a program is equal to 1 (block 252). If it is judged that X is equal to 1, a microcontroller 57 will reduce the frequency of VCO73 only by 1MHz (block 254), and will repeat the step indicated by the block 220-234 below. Next, with block 248, a microcontroller 57 judges again whether existence of data was detected. CHIMAKKU [a microcontroller 57 / whether it originates in the manufacture tolerance which may have the received seizing signal in a remote transmitter, and it is expected and reliance is also transmitted on the slightly low frequency] by looking for the data in a frequency lower 4MHz than the frequency memorized in the frequency list.
[0080] When data do not exist again, a program carries out the increment of the X counter (block 250), and it is confirmed whether the value of X is equal to 1 (block 252). When X is not equal to 1, a program progresses to block 256 and it is judged by checking a DATPREV flag there whether one of data was detected before. The received code signal was tested strictly or a DATPREV flag is set up for the first time later so that it may mention later. When data are detected before, it is shown by the microcontroller 57 that make it LED48 blink quickly (block 258), and the training procedure was successful. On the other hand, if the program of a microcontroller judges that data are not detected before, a program will return to block 218, will search the next frequency in a frequency list, and will carry out clear [of the X register].
[0081] A microcontroller 57 repeats the procedure of the step indicated by the above-mentioned block 218-256 until a microcontroller 57 detects existence of the data in BURONNKU 248. When data exist, a program progresses to block 260 (drawing 13), and a program saves the value of X there. It has the value of "0", when this value has the frequency of VCO73 lower than the frequency of the last searched from the frequency list 3MHz and data are detected, and when the frequency of VCO73 is lower than the frequency searched from the frequency list 4MHz, it has the value of "1." Next, the program of a microcontroller adds the intermediate frequency (IF) of the band-pass filter 82 which is 3MHz preferably to the frequency of the signal before outputted from VCO73. In addition, a microcontroller 57 is aligned with the proper frequency for these increased VCO frequencies in an antenna (block 262).
[0082] Next, a program judges whether data exist or not by calling a VERIFY subroutine with block 264. If it increases only by 3MHz so that the frequency of VCO73 may turn into the same frequency as RF seizing signal when a microcontroller 57 checks existence of data with block 248 (drawing 12) and it is lower than the frequency of RF seizing signal which the frequency of VCO73 received 3MHz, generally the detected data will disappear. However, it judges whether it was set as the value lower 4MHz than the frequency with which the program of a microcontroller checked the value of X with block 268 when judged with that in which data exist [a microcontroller 57] with block 266 when the frequency of VCO73 increases only by 3MHz, and the frequency of VCO73 was searched from a frequency list to the last before. When the frequency of VCO is lower than the frequency searched by the last from the frequency list 4MHz, a microcontroller 57 carries out the increment of the VCO, is re-aligned in an antenna 59 (block 270), returns to block 264, and tries only 1MHz of checks of data again. When data are detected again, it is restored to that initial value the mode bit of the original data with which

programs are return and this block at block 272, and were checked was remembered to be at MODSV. next, the data which the program of a microcontroller is block 274 and were detected by calling the "ENCODE" subroutine -- ** -- it applies to a strict test.

[0083] In the ENCODE subroutine shown in drawing 20 and drawing 21 , a microcontroller 57 carries out clear [of the RAM] with block 276 first, and it judges whether a mode bit is equal to 1 with block 278. When a mode bit is equal to 1, a microcontroller 57 makes interruption possible so that each period in a data string can be specified with 10kHz or 20kHz (block 282) (block 280). Next, a microcontroller 57 judges whether the period of 10kHz of 12 which a microcontroller follows was received in order to judge whether frequency deviation alignment was carried out corresponding to the seizing signal transmitted by the transmitter of a GENIE brand (block 284). When the period of 10kHz of continuous 12 is not received, a program carries out the increment of the error counter (block 286), and it is confirmed whether the error counter has reached the too high value (block 288). When the error counter has not reached a too high value, a microcontroller 57 continues the actuation (block 284) which judges whether each period was specified as either 10kHz or 20kHz (block 282), and the period of 10kHz of continuous 12 was received.

[0084] After receiving the period of 10kHz of 12 in which a microcontroller 57 carries out continuous and loading RAM with the received data corresponding to periodicity (10kHz and 20kHz) (block 290), a program sets up a continuation flag (block 292) and returns to the block following the block with which the ENCODE subroutine was called at the end.

[0085] However, if a program 57 judges that the error counter reached the too high value with block 288, it will judge with that whose received data are "single tone" data, and the flag which shows that data are a single tone will be set up (block 294). Next, with block 296, it judges whether the microcontroller 57 has the dead-time period when data are long. When it has the dead-time period when data are long, a microcontroller 57 discriminates data from what is single tone data of a word format, and measures and memorizes the die length of a dead time (block 298). After not having the dead-time period when data are long was judged, or after identifying data as it is single tone data of a word format, a microcontroller 57 memorizes a data string to RAM, and measures the period of 250 periods of received data with block 300. Next, a microcontroller 57 classifies the result into two possible frequencies, and saves the die length and the mutual number of adjustment of a period (block 302). It judges whether it can consider that data are GENIE data "dirty (it became dirty)" by either of two frequencies which was used with block 306 next in order to classify a period being in 10 or 20kHz, or judging whether it is close to them, if a microcontroller 57 judges with that 200 or more adjustment was proved about one side of two frequencies that it is with block 304. When data may be dirty GENIE data, or when [which 200 or more adjustment finds out with block 304 / have] it shines, the program of a microcontroller carries out clear [of the success flag] with block 308, and returns to the block following the block with which the ENCODE subroutine was called at the end.

[0086] in block 306, it is a microcontroller 57 -- if it judges data being dirty GENIE data and not obtaining, a microcontroller 57 will save the period when 200 or more adjustment was found out (block 310), a success flag will be set up (block 312), and a program will return to the block following the block with which the ENCODE subroutine was called at the end.

[0087] If it is shown that the data with which the microcontroller 57 judged the mode bit to be a thing not equal to 1, and was searched with the block 278 of the ENCODE subroutine of drawing 20 are slow speed data, a microcontroller 57 will be prepared so that received data may be sampled in 68 microseconds with block 314 (drawing 21). Next, with block 316, a microcontroller 57 looks for the start condition in retrieval data which exists when the sample of continuous 70 is found out with low logical level. When a start condition is not found out, (block 318) is identified within block 320, and a microcontroller 57 identifies data as "constant pulse data." After data were specified as "constant pulse data", or after monitor conditions are detected by block 318, a microcontroller 57 judges next whether data disappeared with block 322 by judging whether the measurement size which low logical level follows is over the predetermined number. If the thing and microcontroller 57 to which data disappeared with block 322 judge, a microcontroller will carry out clear [of the success flag] with block 324, and a program will

return to the block following the block called an ENCODE subroutine. On the other hand, if a microcontroller 57 judges data to be what has not disappeared, a microcontroller will memorize data with either high logical level or low logical level as a measurement size which continues data (block 326), a success flag will be set up (block 328), and a program will return to the block following the block called an ENCODE subroutine.

[0088] It will be checked if it is in the frequency searched at the last of a frequency list when it returned to drawing 13 . Moreover, when coding of the data checked when it was in the frequency lower 3MHz than the frequency searched at the end is successful (block 330), the program of a microcontroller checks the value of X. It judges whether it was set as the value with the frequency of VCO73 lower 4MHz than the frequency searched by the last from the frequency list at the end (block 332). When VCO is before set up on the frequency lower 4MHz than the frequency searched at the end, a microcontroller 57 carries out the increment only of the 1MHz of the VCO frequencies, and a program tends to return to block 274 and tends to encode data. Next, if coding of this data is successful, a program will progress to block 336 and the increment of the noise counter NOISCNT will be carried out there.

[0089] Next, with block 338, a microcontroller 57 checks the value of NOISCNT, this value is too high, and it judges whether the transmission-and-reception machine 43 which can be trained on the frequency on which data were checked has received the noise. When the value of NOISCNT is too high, the frequency with which the microcontroller 57 was searched by the last from the frequency list judges whether it is the Canada frequency (namely, frequency relevant to the seizing signal of a short duration) (block 340).

[0090] When there is no value of NOISCNT past [high] (block 338), or when the frequency with which the value of NOISCNT was searched by the last from past [the high one] and a frequency list is not the Canada frequency, a program is restored to the value which it had before transmitting the frequency of VCO73, and the value of X to block 341 return (drawing 12) and there at the block 260 of B drawing 9. Next, a program carries out the increment of the value of X with block 250, and it judges whether the value of X is equal to 1 with block 252. When the value of X is not equal to 1, a program progresses to block 256 and it judges whether data were detected there before. When data are detected before, it is shown that the microcontroller 57 outputted the signal it is made to blink LED48 rapidly next, and training was successful (block 258). However, when X is equal to 1, (block 252) is reduced, a microcontroller 57 reduces the frequency of VCO only by 1MHz (block 254), and it looks for the data in the frequency by repeating the step indicated in block 220-248.

[0091] If a program judges with the frequency with which NOISCNT was searched by the last from Takasugi and a frequency list at blocks 338 and 340 when drawing 13 was referred to again being the Canada frequency, a program sets up the pointer of a frequency list so that the first frequency which continues after the Canada frequency may be pointed out (block 342), and in order to try detection of the data in the remaining frequency memorized in the frequency list, it will progress to block 218 (drawing 12).

[0092] As mentioned above, when the frequency of VCO73 is set as a frequency lower 3MHz than RF seizing signal and an effective-data code exists, if only 3MHz is raised so that it may be in agreement with the frequency of RF seizing signal which the frequency of VCO73 received, data will disappear. Furthermore, when coding of the data detected when it was increased so that it may become the same as the frequency of RF seizing signal which the frequency of VCO73 received is not successful, (block 330) and an effective-data code will exist. Thus, when coding of the data by which data are not detected with block 266 and which were case [data] or detected is successful with block 330, a program progresses to block 344 (drawing 14), a program adds the intermediate frequency of 3MHz to a VCO frequency there, and an antenna 59 is re-aligned.

[0093] Next, a program performs the check for judging whether the data which can be checked by calling the VERIFY subroutine of block 346 (drawing 14 R> 4) re-appeared. If a program judges with that to which data exist in block 348, it will judge whether the data detected by examining whether a program is tested next (block 350) and is equal to 1 or 0 are rapid data. [of a mode bit] When data are rapid data (namely, MODE=1), the program performed by the

microcontroller 57 tries by calling the ENCODE subroutine of drawing 20 to encode this rapid data with block 352. When coding of rapid data is not successful (block 354), or when a program judges that data do not exist in block 348, the check of the existence of data is again tried by what a microcontroller 57 carries out the increment only of the 1MHz of the VCO frequencies, and an antenna 59 is re-aligned (block 356), and the VERIFY subroutine of drawing 10 is called for (block 358).

[0094] When data exist (block 360), a microcontroller 57 judges whether data are rapid data with block 362. When data are rapid data, a microcontroller 57 tries coding of this rapid data by calling an ENCODE subroutine, as shown in block 364. when coding of rapid data is not successful (block 366), or when a microcontroller 57 does not detect data with block 360, a microcontroller 57 is 2MHz about a VCO frequency -- it ******, an antenna 59 is re-aligned (block 368), and existence of data is checked by calling a VERIFY subroutine with block 370.

[0095] Next, if a program judges that data exist with block 372 (drawing 14 R> 4), a program will be block 374 and it will judge whether the detected data are rapid data. When the detected data are rapid data, a program tries coding of this rapid data with block 376 by calling an ENCODE subroutine. When coding of this rapid data is not successful (block 378), or when a program judges that data do not exist with block 372, a program performs the process shown to block 336-342 that it progressed and mentioned above in the block 336 (drawing 13).

[0096] When it succeeds in coding of the rapid data by which the program was detected with blocks 350 and 362 (drawing 1414) or block 374 (drawing 15), a program progresses to the block 380 of drawing 16 R> 6. When similarly it succeeds in coding of the rapid data by which the program was detected with blocks 354 and 366 (drawing 14) or block 378 (drawing 15), a program progresses to the block 380 of drawing 16 .

[0097] After progressing to the block 380 of drawing 16 , a mode bit is restored to the value saved at the MODSV register, and the frequency of VCO73 is restored to the frequency on which data were detected first. Next, it judges whether a microcontroller 57 is the frequency of the common knowledge for which the frequency from which the received seizing signal was discriminated is used with rolling, real time, or other adjustable codes (block 381). or -- or additionally, a microcontroller 57 may check the property of others of a seizing signal like the number of bits in a code which received, and you may judge whether a code is an adjustable code. When a code is an adjustable code potentially, as for a microcontroller 57, the rolling code ID (RCID) subroutine 382 is called. The example is explained below with reference to drawing 23 .

[0098] By the rolling code ID subroutine 382, the code which received the microcontroller 57 first judges whether it changes dynamically (block 500). (namely, change under actuation of a transmitting carbon button) When a code does not change dynamically, a microcontroller 57 memorizes the identified code to the 1st storage area MEM 1 (block 501), and the transmitting carbon button of the remote transmitter 65 is urged to a user that it is made to re-operate (block 502). Next, in order to restore to the seizing signal to which it received and retransmitted a message, using the same frequency, a microcontroller 57 receives the code contained in this signal, and memorizes it to other storage areas MEM 2 (block 506). A microcontroller 57 compares the code memorized next in two storage areas (block 508), and it judges whether codes differ or not (block 510). When codes do not differ, a microcontroller 57 is judged to be that for which the remote transmitter 65 does not use the adjustable code, and a program returns to block 383 (drawing 16). When the code from which two codes differ and which was case [the code] or received is changing dynamically, a microcontroller 57 examines the property of the received seizing signal, and judges the format and model of the remote transmitter 65 as compared with the transmitter discernment data which had such information memorized. Pulse width, a pulse recurrence rate, the code number of bits, and/or the identified carrier frequency may be contained in such a property. Based on the format of the remote transmitter 65, and discernment of a model, a microcontroller 57 specifies the cryptographic algorithm corresponding to the cryptographic algorithm which the remote transmitter and receiver with which the model was discriminated from the same format use memorized in advance in memory (block 514). When cryptographic algorithm is not memorized in advance in

the memory of a microcontroller, this may be downloaded through input terminal 62a. In addition, when the manufacturer of a remote transmitter cannot be specified based on the property of the seizing signal which the microcontroller 57 received, you may urge him for a microcontroller 57 to input the identification code which identifies the format and model of a remote transmitter to a user, or an identifier. such information may be inputted through input terminal 62a boiling switches 44, 46, and 47 variously, and combining and pushing them or by using a user interface which is indicated by above-mentioned U.S. Pat. No. 5,555,172.
[0099] After cryptographic algorithm is identified or being inputted by the other approaches, in order to identify the consecutive number relevant to either the code transmitted at the end or the code which should be transmitted to a degree to a user, he is urged for a microcontroller 57 to perform "a special procedure" (block 516). This special procedure is a procedure performed in order to carry out resynchronization of a transmitter and the receiver according to the methodology which a specific manufacturer uses. Depending on the case, following either, its one, or its combination may be included in it. That is, it is inputting a code into the keypad of the remote transmitter 65 with which only a predetermined period's maintains the condition of having pushed the transmitting carbon button which pushes the transmitting carbon button of the remote transmitter 65 two consecutive times rapidly etc. Operating the resynchronization of the garage door disconnection device 66 or a reset switch for such a special procedure, and a receiver receiving the following code, and carrying out resynchronization in received following code may be included.
[0100] After discriminating the consecutive number of the following code transmitted from cryptographic algorithm, the microcontroller 57 has information required to generate a series of suitable codes for cryptographic algorithm to open a garage door succeedingly using a code key, when ****. When an algorithm needs the above keys, a microcontroller 57 must generate at random the code key which learns the code key which a remote transmitter or a related receiver uses, receives, is transmitted by the special signal, or communicates to a receiver by the other approaches. Thus, it judges whether a microcontroller 57 has the procedure of (OT) of a transmitter proper, in order to download a code key based on the methodology of the common knowledge which the specified manufacturer uses (block 518).
[0101] In order to download a code key, when a thing procedure peculiar to a transmitter can be utilized, a microcontroller 57 performs the algorithm memorized in advance, in order to perform a procedure (block 520). Urging him to do a certain activity like same technique of arbitration which was mentioned above in relation to the special procedure for resynchronization so that might push the specific transmitting carbon button of the remote transmitter 65 to a user may be included in this procedure. By performing a thing procedure peculiar to a transmitter, a code key downloads to the nonvolatile storage of a microcontroller 57 (block 522).
[0102] A microcontroller 57 can also translate the consecutive number next using cryptographic algorithm and a code key for the synchronous object (block 524). (if required) Next, a microcontroller 57 blinks LED48 rapidly and it is shown that training of a signal was successful (block 526).
[0103] When there is no procedure of the transmitter proper for downloading a code key, it is assumed that a microcontroller 57 can reset the receiver of the garage door disconnection device 66 by performing push or other procedures of a certain for a carbon button in order to receive a new code key and to utilize this. Thus, a microcontroller 57 generates a code key at random (block 528), and a receiver is synchronized by transmitting a key to a receiver using the proper protocol of the receiver of the format specified in order to download a new key, and a model (block 530). When a receiver is synchronized, a microcontroller 57 blinks LED48 rapidly and it is shown that the training procedure was successful (block 526).
[0104] In order to open a garage door, when one or more transmitters are used, in order that a microcontroller 57 may judge the part of the code showing the header of the message containing ID tag of a transmitter, the part of the transmitted code containing a transmitter ID tag is discriminable by comparing with the code which carried out the received code the recurrence student using cryptographic algorithm, and received the code which acted as the recurrence student. Identified ID tag may be memorized with other data of the arbitration containing the

message header fixed next in order to retransmit a message with an adjustable code succeedingly.
[0105] If drawing 16 is referred to again, when a frequency is not a frequency of the common knowledge used for adjustable codes, clear [of the noise counter NOISCNT] is carried out (block 383), and a VERIFY subroutine is called with block 384. Next, it is begun slowly for a microcontroller 57 to set a timer for 5 seconds, and to carry out the duplex flash of LED48 in the mode distinguished clearly, in order to urge him to push the start switch of the remote transmitter 65 again to an operator when the data which can be checked do not exist (block 386) (block 388). Usually, although it is unnecessary, a microcontroller 57 raises possibility of succeeding in study of the seizing signal of a duration with the short transmission-and-reception machine 43 which can be trained, by urging an operator for a remote transmitter to broadcast the seizing signal again.
[0106] Next, a program repeats and calls a VERIFY subroutine until the data which can be checked are detected (block 392), or until a predetermined period like [for 5 seconds] passes (block 394) (block 390). If the data which can be checked are detected by block 386 or block 392 or time amount passes with block 394, a program will call an ENCODE subroutine (block 396). Then, when coding of data is not successful, (block 398) is carried out, a program carries out the increment of the noise counter (block 400), and it is confirmed whether NOISCNT is equal to 4 (block 402). When NOISCNT is not equal to 4, a program returns to block 384 and tries again the check and coding of data code which were received. case NOISCNT is equal to 4 -- (block 402) a program -- the -- it progresses to the block 341 of 9A drawing, and a VCO frequency and X counter are restored there and a process progresses to block 250 as mentioned above.
[0107] If judged with what succeeded in coding of data code with block 398, a program will confirm whether data were identified as single tone data with block 404 in advance. When data are single tone data, as for a program, a subroutine (SUBRN) bit judges whether it is set up in advance (block 406). At first, the SUBRN bit is not set up. However, when a SUBRN bit is set up with block 494 (drawing 18) by the ability not succeeding training of single tone data in advance, a process carries out return with block 400, a program carries out the increment of the noise counter NOISCNT to block 406, and a process is advanced as mentioned above. If the thing and microcontroller 57 whose detected data are not single tone data judge with block 404, a microcontroller 57 will try condensation of the data encoded by calling a CONDENCE subroutine with block 408. A CONDENCE subroutine is used in order to try condensation of the data memorized by memory during the newest activation of an ENCODE subroutine so that it may be what repeated the data sequence many times and the memorized good code signal may not waste the memory beyond the need. A CONDENCE subroutine is explained with reference to drawing 2222 here.
[0108] First, it judges whether the mode bit of FUROGURAMU is equal to 1 with block 410. When a mode bit is equal to 1, a program judges whether a certain data which have three periods or a period below it exist (that is, is the data sequence by which only the count below 3 times or it is repeated within the data string by whom the encoded data were encoded and memorized within the microcontroller 57 included or not?). When data have three periods or a period below it, a program is block 414, shows what the attempt which condenses data went wrong, and returns to block 446 (drawing 1616).
[0109] On the other hand, when the data which have three periods or a period below it do not exist, a program judges whether the encoded data which were memorized have 10kHz data of 30 or more periods (block 416). When there are 10kHz data of 30 or more periods, it returns to the process of drawing 16 which shows that the attempt for which a program condenses data went wrong (block 414) (block 446). When there are no 10kHz data which have 30 or more periods, (block 416) and a program are set as the 1st data location of the data which the initiation pointer of the condensed data code was encoded and were memorized (block 418). Next, before FUROGURAMU's setting up the last pointer of the memorized condensation data equally to the 10kHz data of the last which has 12 or more periods (block 420) and returning to the block 446 of drawing 16 , it is shown that the attempt which condenses data was successful (block 422). Thus, the memorized coded data can be condensed in the format which can be repeatedly read

from memory into a transmitting mode and which was shortened more.

[0110] When a mode bit was not equal to 1 and a program judges with block 410, it judges whether a program contains a low period with the memorized long coded data (block 424). When the memorized data do not contain the long low period, it is judged with that whose data are continuous data with block 426, and judges with a program using the whole data bang with block 428, in order to memorize the encoded data. The last pointer of the data which the condensed initiation pointer for data was set up equally to the 1st location of the memorized coded data (block 430), and were condensed when data were judged with block 424 to be a thing containing a long low period is set up equally to the location of the last of the long low period in the memorized coded data (block 432).

[0111] Then, it judges whether a program examines the memorized condensation data and data include the logical high-level condition that 120 or the sample beyond it continues (block 434). When such a continuous logical high-level condition is found out, a program shows what the attempt which condenses data with block 436 went wrong, and returns to the block 446 of drawing 16 . When there is no continuous high-level condition of 120 or more samples, the memorized condensation data are examined and it is judged whether there is any appearance of a logical high level or a low condition in two continuous samples. (Block 440) . If such an appearance is identified, what the attempt which condenses data with block 436 went wrong will be shown, and a block will progress to block 446.

[0112] When such an appearance is not accepted with block 440, it is judged whether the condensation data string who memorized from the beginning to the last is less than ten samples (block 442). When a data string is die length of less than ten samples, what the attempt which condenses data with block 436 went wrong is shown. On the other hand, when the memorized condensation data consist of 10 or a sample beyond it, it is shown that the attempt which is going to condense data with block 444 was successful, and a program progresses to the block 446 of drawing 16 .

[0113] It is judged whether the attempt which condenses the encoded data with the block 446 of drawing 16 was successful. When an attempt is not successful, a microcontroller 57 carries out the increment of the noise counter NOISCNT with block 400, and a program progresses as mentioned above. When it succeeds in condensation of the encoded data, as for a program, it is judged whether data turned out to be constant pulse data in advance (block 448). When data are not constant pulse data, a program tries coding of data again by calling drawing 20 and the ENCODE subroutine of drawing 21 with block 450. - by which a program progresses to the block 454 of drawing 17 when data are constant pulse data, or when [as coding of data shows the test block 452,] it succeeds with block 450 (block 452) -- when other, a program progresses to block 400, carries out the increment of the noise counter NOISCNT, and advances as mentioned above there.

[0114] By block 454 (drawing 17), when a program examines a mode bit and a single tone bit, data are ** which judges whether it is GENIE data. A mode bit is equal to 1, when single Thon Flagg is not set up, it progresses to a program block 456 and a microcontroller 57 classifies the carrier frequency from which the received seizing signal was discriminated into one of the GENIE clock frequency of some common knowledge which is within the limits of 290 to 320 MHz at intervals of 5MHz there. Thus, when the carrier frequency from which the seizing signal received, for example was discriminated is between 301MHz and 304MHz, a microcontroller 57 is memorized and the carrier frequency for transmitting succeedingly is judged to be what is close with 300MHz and 305MHz. Furthermore, it is shown that the program set up DATPREV Flagg and data were detected with block 456. Next, a program progresses to block 458, and a microcontroller 57 memorizes new data, before returning to the block 218 of drawing 12 .

[0115] With block 454, when the thing and program which are not equal to 1 judge, a program judges whether the value of X is equal to "0", in order to judge whether (block 460) and data were detected first, when the frequency of VCO73 is set as a frequency lower 3MHz than the frequency in a frequency list. When the value of X is equal to "0", it judges whether the program examined the next value in a frequency list, and the value has separated 1MHz from the former value (block 462). When separated from 1MHz of the next frequency in a frequency list, a

microcontroller 57 memorizes new data (block 458), and a program returns to block 218 (drawing 12 R> 2), and it advances as mentioned above. When the next frequency in a frequency list is not separated from the former frequency 1 Mz, a microcontroller 57 saves data, emits a signal, LED48 is blinked quickly, and it is shown that the training procedure was successful (block 464).
[0116] With block 460, when it judges with the program of X not being equal to "0", a program checks DATPREV Flagg and it judges whether it is equal to ** 1 (block 466). When DATPREV Flagg is not equal to 1, a microcontroller 57 saves data, outputs a signal and blinks LED48 quickly (block 464). When DATPREV Flagg is equal to 1, it judges whether the program was trained on the frequency with earlier data lower 3MHz than the frequency memorized in the frequency list (block 468). When earlier data is trained on a frequency lower 3MHz than the frequency memorized in the frequency list, a microcontroller 57 recognizes that made the data obtained when a VCO frequency is a frequency lower 3MHz than the frequency in a frequency list blink return and LED48 quickly again, and the training procedure was successful (block 470). When the frequency of VCO73 is lower than the frequency in a frequency list 3MHz and earlier data is not trained, (block 468) is saved, a microcontroller 57 saves data, LED48 is blinked quickly (block 464), and it is shown that the training procedure was successful.
[0117] When it returned to drawing 16 and judges with that to which it judges with the data code by which the microcontroller 57 was searched with the block 404 being single Thon, and a STUBRN bit is not set with block 406, a program returns to the block 472 of drawing 18 . With block 472, a microcontroller 57 judges whether DATPREV Flagg was set up. When DATPREV Flagg is set up, a microcontroller 57 blinks LED48 quickly and it is shown that the training procedure was successful (block 474). On the other hand, when a microcontroller 57 judges with DATPREV Flagg's not being set up, a microcontroller 57 judges whether the microcontroller is operating by Canada Mohd by judging whether the newest frequency read from the frequency list is the Canada frequency (block 476). When the microcontroller 57 is operating by rapid Canada Mohd, it returns to the block 308 of the program drawing 1212 , and advances as mentioned above. When the microcontroller 57 is not operating by rapid Canada Mohd, a program adds the intermediate frequency of 3MHz to the frequency of VCO73 (block 478).
[0118] Next, a microcontroller 57 memorizes the value of R required for the frequency increased in the NVM, and the value of N (block 480). Next, a microcontroller 57 reduces the frequency of VCO73 only by 2MHz (block 482), and saves this frequency in adjustable [DATCHK] (block 484). Next, in order that a program may try coding of data on this new frequency, drawing 20 and the ENCODE subroutine of drawing 2121 are called (block 486). When coding of this data is not successful, (block 488) is set up, a program sets up DATPREV Flagg (block 490), and it returns to the block 218 of drawing 12 . By returning to block 218, as for a program, data may confirm [3 or] whether it may be low 4MHz rather than the next frequency in a frequency list. When the data checked on these frequencies are not found, since a program judges with DATPREV Flagg's being set up with block 256, it can show a success of training with block 258.
[0119] If a program is judged with block 488 to be that in which the attempt of coding of data succeeded, a program will judge whether the data encoded with block 492 are single Thon data. When data are not single Thon data, a microcontroller 57 carries out clear [of the noise counter NOISCNT], sets up a STUBRN subroutine bit (block 494), and returns to the block 480 of drawing 16 . When the data with which coding was successful are single code data, a microcontroller 57 checks the frequency of data and it judges whether it is 18MHz or more (block 496). Next, when the frequency of data is 18kHz or more, as for a microcontroller 57, the frequency of former one of data confirms whether be less than 15kHz (block 498). When former one of data does not have the frequency of less than 15kHz, or when the single Thon data with which coding was successful are not 18kHz or more, the program of a microcontroller returns to block 476 and advances as mentioned above. When former one of data has the frequency of less than 15kHz, a program sets up DATPREV Flagg (block 500), returns to the block 218 of drawing 12 , and advances as mentioned above.
[0120] The above-mentioned process is continued until a success of a training procedure is accepted, or until a microcontroller 57 finishes examining all frequencies at intervals of 1MHz between 200MHz whose remote transmitters are the frequency which generally operates, and

400MHz.

[0121] Although this invention has so far been explained as what operates in a specific mode including a component [****] based on a suitable example, a side face with this invention may be carried out without needing the particulars of the description of others of this invention. For example, the transmission-and-reception machine which can train this invention does not need to perform the procedure trained so that the antenna or variable gain amplifier which can be aligned dynamically may not be included and a duration may correspond to a shorter seizing signal. Similarly, the training procedure of an adjustable seizing signal does not necessarily need to perform the above-mentioned suitable example in the specific structural embodiment. For example, training of an adjustable seizing signal can be carried out also with the transmission-and-reception machine which is indicated by U.S. Pat. No. 5,442,340 or U.S. Pat. No. 5,475,366 and which can be trained.

[0122] In addition, in order to train so that it may correspond to an adjustable code seizing signal and to supply a certain required data to a microcontroller, the approach except having indicated above may be used. For example, data like a code key may be transmitted to the microcontroller of the transmission-and-reception machine which can be trained using a paging signal. In order to control the accessory of a car, the system which receives a paging signal is indicated by U.S. Pat. No. 5,479,157 "the remote programming system for cars." In order to download from the CD player of a car for some manufacturers to the microcontroller of the transmission-and-reception machine which can be trained, there will also be an option for equipping a system with a compact disc (CD-ROM) using the adjustable code containing cryptographic algorithm and a key. In order to control the accessory of a car, the system using CD in the CD player of a car is indicated by U.S. Pat. No. 5,525,977 "the acceleration system for individualizing a car" delivered on June 11, 1996.

[0123] Probably, you may train so that such a resynchronization signal may be learned and the transmission-and-reception machine which can train this invention may be broadcast again, when the remote transmitter which transmits an adjustable code is adaptation-ized also so that a resynchronization signal may be transmitted to a receiver, when a transmitter and a receiver carry out step-out. This could be easily attained by training one of the channels of other of a transmission-and-reception machine using the above-mentioned procedure for training so that it may correspond to a seizing signal.

[0124] Although this invention has so far been explained as what operates in a specific mode including a component [****] based on a suitable example, a side face with this invention may be carried out without needing the particulars of the description of others of this invention.

[0125] It is prescribed by the claim, and I will be understood by the expert by whom that various modification and amelioration of this invention are possible carries out this invention, without separating from the meaning and the range of this invention which should be judged by the interpretation of the wide sense accepted a law.

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DESCRIPTION OF DRAWINGS

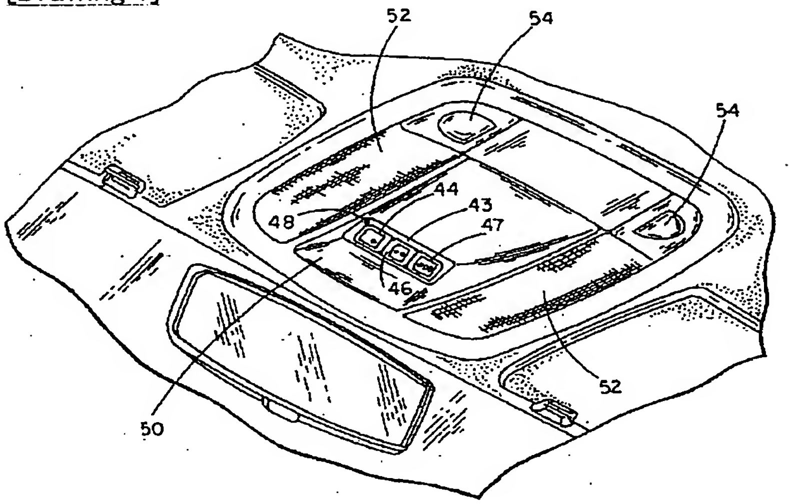
[Brief Description of the Drawings]
[Drawing 1] It is the partial perspective drawing in the car which has an overhead console for storing the transmission-and-reception machine which can train this invention.
[Drawing 2] It is the perspective drawing of the transmission-and-reception machine which can train this invention.
[Drawing 3] It is the perspective drawing of the visor which incorporated the transmission-and-reception machine which can train this invention.
[Drawing 4] It is the perspective drawing of the Miller assembly which incorporated the transmission-and-reception machine which can train this invention.
[Drawing 5] It is the rough partial block diagram of the electrical diagram of the transmission-and-reception machine which can train this invention.
[Drawing 6] It is the rough partial block diagram of the electrical diagram showing the detail of the circuit shown in drawing 5.
[Drawing 7] It is the rough partial block diagram of the electrical diagram showing the detail of the voltage controlled oscillator shown in drawing 6 .
[Drawing 8] It is the rough partial block diagram of the electrical diagram showing the detail of the mixer shown in drawing 6 , a band-pass filter, amplifier, and integrator.
[Drawing 9] It is the rough partial block diagram of the detail **** electrical diagram of a phase locked loop shown in drawing 6 .
[Drawing 10] It is a flow chart for programming the microcontroller shown in drawing 5 and drawing 6 .
[Drawing 11] It is the detailed flow chart of a signal transmitting routine shown in drawing 10 .
[Drawing 12] It is the flow chart of the training procedure carried out by the microcontroller shown in drawing 5 and drawing 6 .
[Drawing 13] It is the flow chart of the training procedure carried out by the microcontroller shown in drawing 5 and drawing 6 .
[Drawing 14] It is the flow chart of the training procedure carried out by the microcontroller shown in drawing 5 and drawing 6 .
[Drawing 15] It is the flow chart of the training procedure carried out by the microcontroller shown in drawing 5 and drawing 6 .
[Drawing 16] It is the flow chart of the training procedure carried out by the microcontroller shown in drawing 5 and drawing 6 .
[Drawing 17] It is the flow chart of the training procedure carried out by the microcontroller shown in drawing 5 and drawing 6 .
[Drawing 18] It is the flow chart of the training procedure carried out by the microcontroller shown in drawing 5 and drawing 6 .
[Drawing 19] It is the flow chart of a data validation subroutine used during the training procedure carried out by the microcontroller shown in drawing 5 and drawing 6 .
[Drawing 20] It is the flow chart of a coding subroutine used by training programming carried out by the microcontroller shown in drawing 5 and drawing 6 .
[Drawing 21] It is the flow chart of a coding subroutine used by training programming carried out by the microcontroller shown in drawing 5 and drawing 6 .
[Drawing 22] It is the flow chart of a condensation subroutine used by training programming carried out by the microcontroller shown in drawing 5 and drawing 5 .
[Drawing 23] It is the flow chart of the rolling code discernment (RCID) and the training subroutine which are used by the training program carried out by the microcontroller shown in drawing 5 and drawing 6 .
[Drawing 24] It is the graphical representation of the general transmission pattern of the transmitter carried in a car and a car.
[Description of Notations]
43 Transmission-and-Reception Machine Which Can be Trained
44 Push Button Switch

45 Housing
46 Push Button Switch
47 Push Button Switch
48 Light Emitting Diode
49 Interface Circuitry
50 Overhead Console
51 Visor
52 Light for Map Decipherment
53 Reflector Glass Assembly
54 Switch
55 Transmission-and-Reception Machine Circuit Which Can be Trained
56 Power Source
57 Microcontroller
58 Radio Frequency Circuit
59 Antenna
60 Dc-battery
65 Remote Transmitter
66 Garage Door Disconnection Equipment
70 Minor Loop Antenna
71 Varactor Diode
72 D/A Converter
73 Voltage Controlled Oscillator
74 Variable Gain Amplifier
76 Coupled Circuit
77 Transmitting Amplifier
78 Output Capacitor
79 Mixer
80 Capacitor
81 Receive Buffer
82 Band-pass Filter
83 Amplifier
84 Integrator
85 Phase Locked Loop Circuit
86 Criteria Oscillator
87 Amplifier
88 Comparison Amplifier
89 Low-pass Filter
90 Armature-voltage Control Buffer
92 R Division Register
93 N Division Register
94 Phase / Frequency Detector
98 Receiving Side / Source Change Circuit
99 Switch
100 Switch
103 Oscillator
104 LC Resonator
110 Oscillation Transistor
112 Capacitor
114 Switching Transistor
116 Buffer Transistor
118 Resistor
120 Coupling Capacitor
122 Inductor
124 Coupling Capacitor

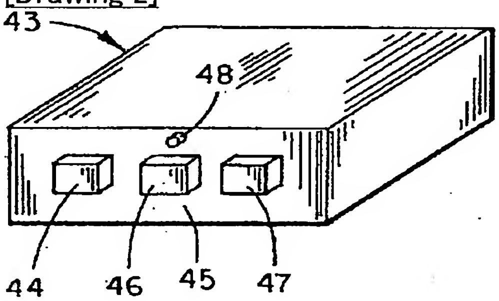
126 Varactor Diode
128 Varactor Diode
130 Resistor
140 Input Port
141 Input Port
142 Capacitor
143 Transistor
144 Resistor
145 Feed Bus-bar
146 Pull-up Resistor Machine
148 Resistor
150 Resistor
152 Capacitor
154 Inductor
156 Capacitor
157 Output Terminal
158 Coupling Capacitor
161 Output Terminal
162 Capacitor
164 Capacitor
168 Transistor
170 Resistor
172 Resistor
174 Resistor
175 Joint
176 Capacitor
178 Capacitor
180 Resistor
188 Diode
190 Integrating Capacitor
192 Resistor
194 Capacitor
196 Output Terminal

DRAWINGS

[Drawing 1]



[Drawing 2]



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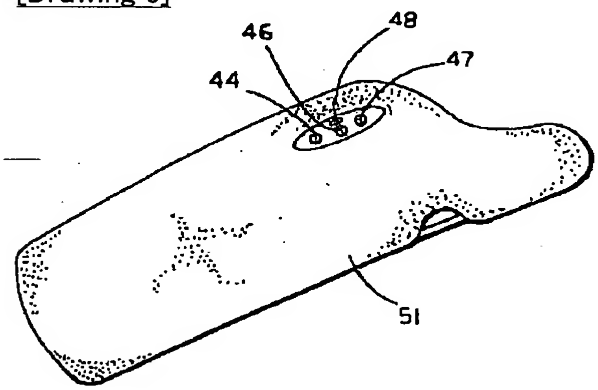
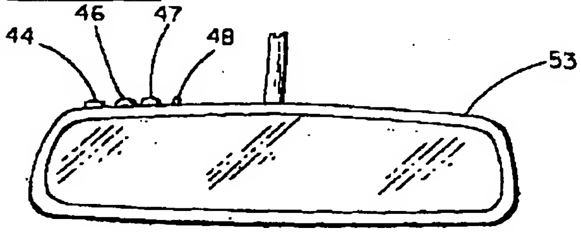
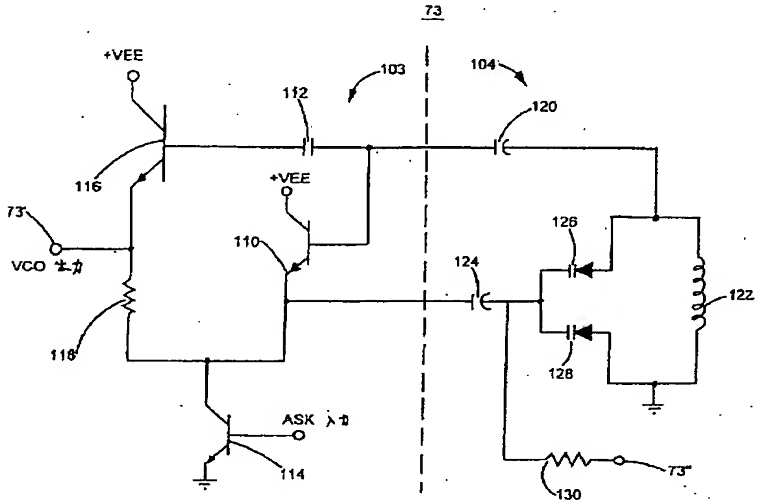
[Drawing 3]



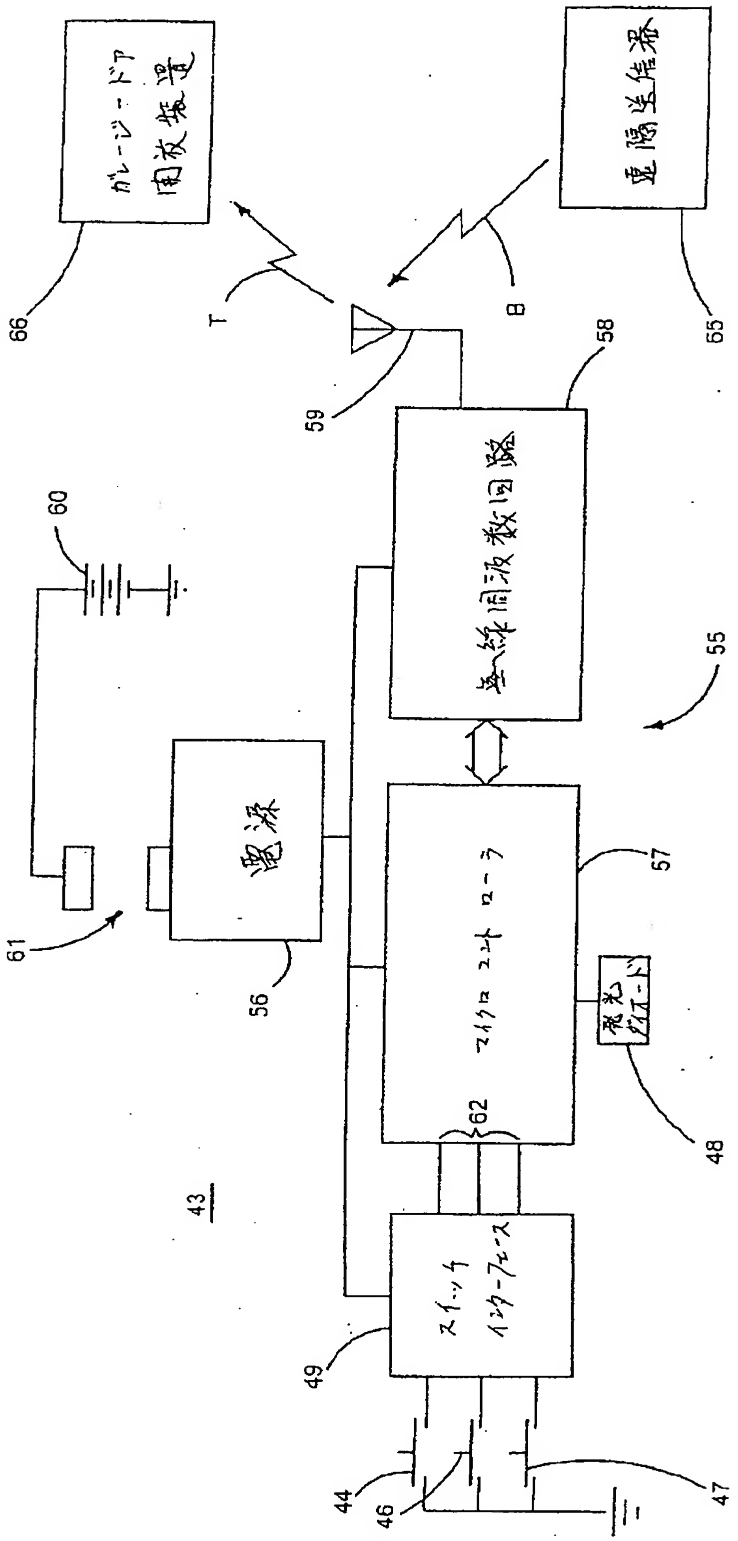
[Drawing 4]



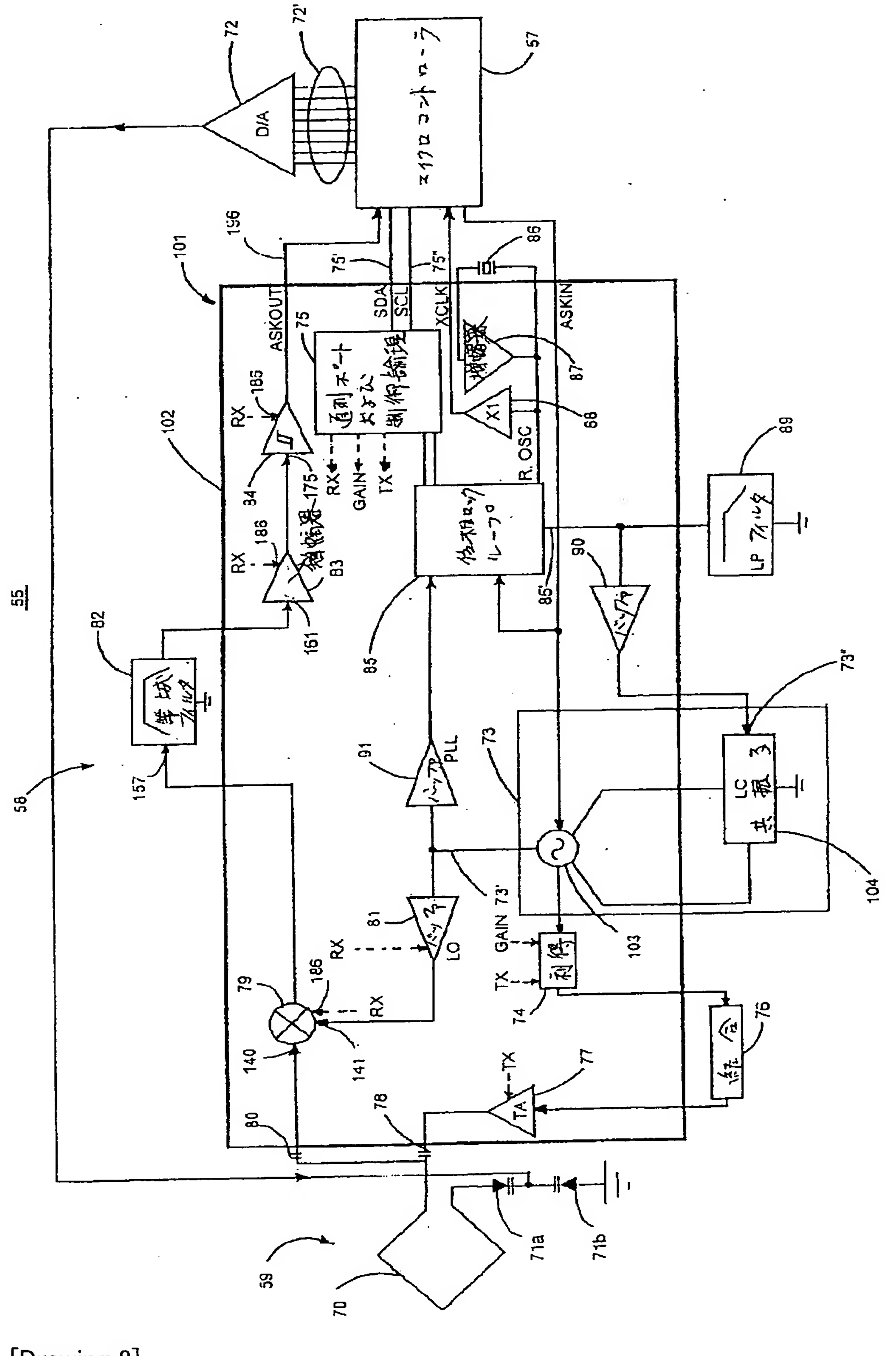
[Drawing 7]


73
+VEE
103
104
112
120
116
+VEE
73
110
126
VCO 出力
124
122
118
128
ASK 入力
114
130
73

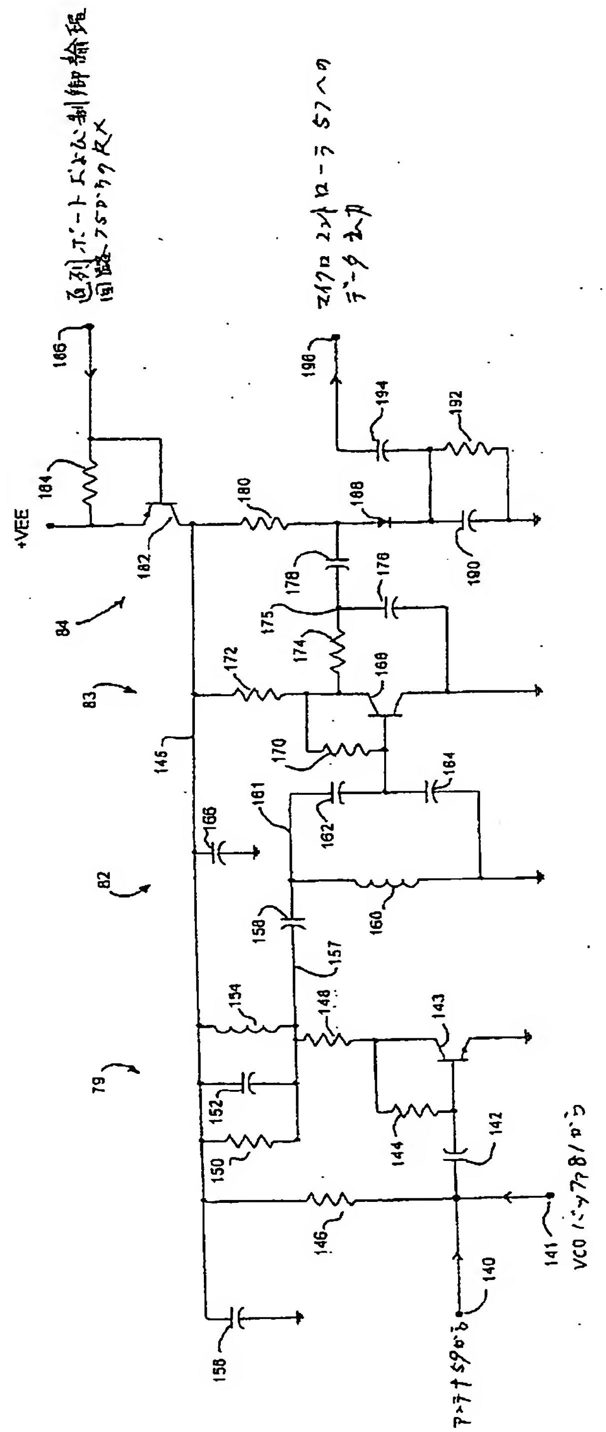
[Drawing 5]


ガレージ・ドア
開放装置
遠隔送信器
無線周波数回路
マイクロコンピュータ
電源
スイッチ
インターフェース
発光
ダイオード
66
65
T
B
58
59
60
55
57
61
56
62
48
43
49
44
46
47

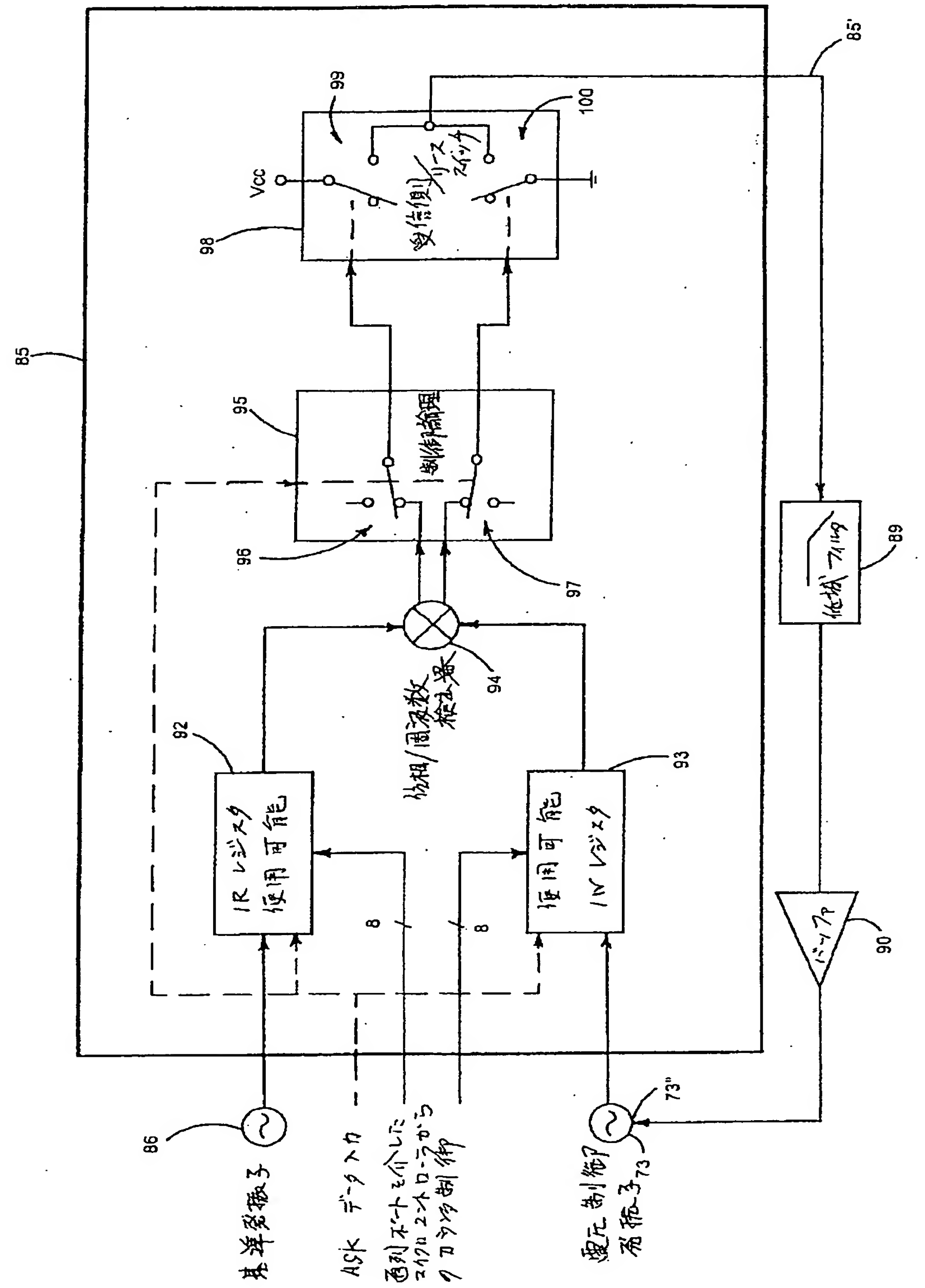
[Drawing 6]


D/A
マイクロ コントローラ
ASKOUT
ASKIN
SDA
SCL
XCLK
R. OSC
X1
RX
GAIN
TX
LP フィルタ
PLL
LO
TA
55

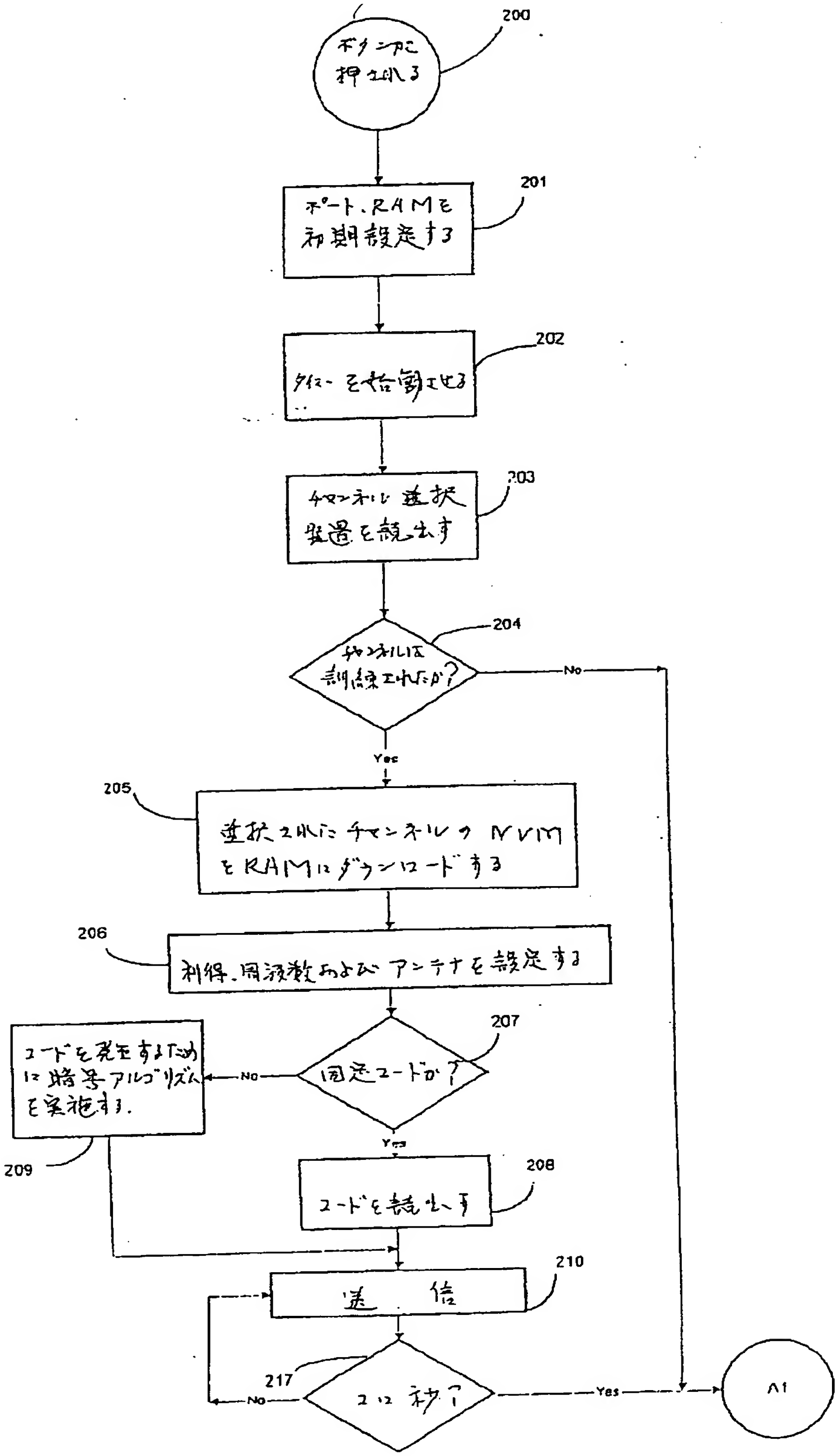
[Drawing 8]


+VEE
VCO
140
141
142
143
144
145
146
148
150
152
154
156
157
158
160
161
162
164
166
168
170
172
174
175
176
178
180
182
184
186
188
190
192
194
196
79
82
83
84

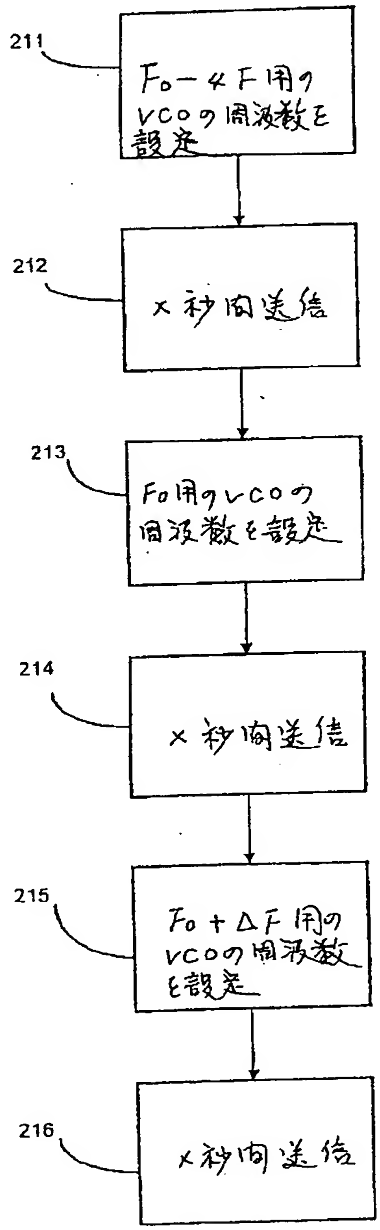
[Drawing 9]


85'
99
100
98
Vcc
85
95
96
97
92
94
93
8
8
90
89
86
73"
73
ASK データ入力
基準発振子
低域フィルタ
バッファ

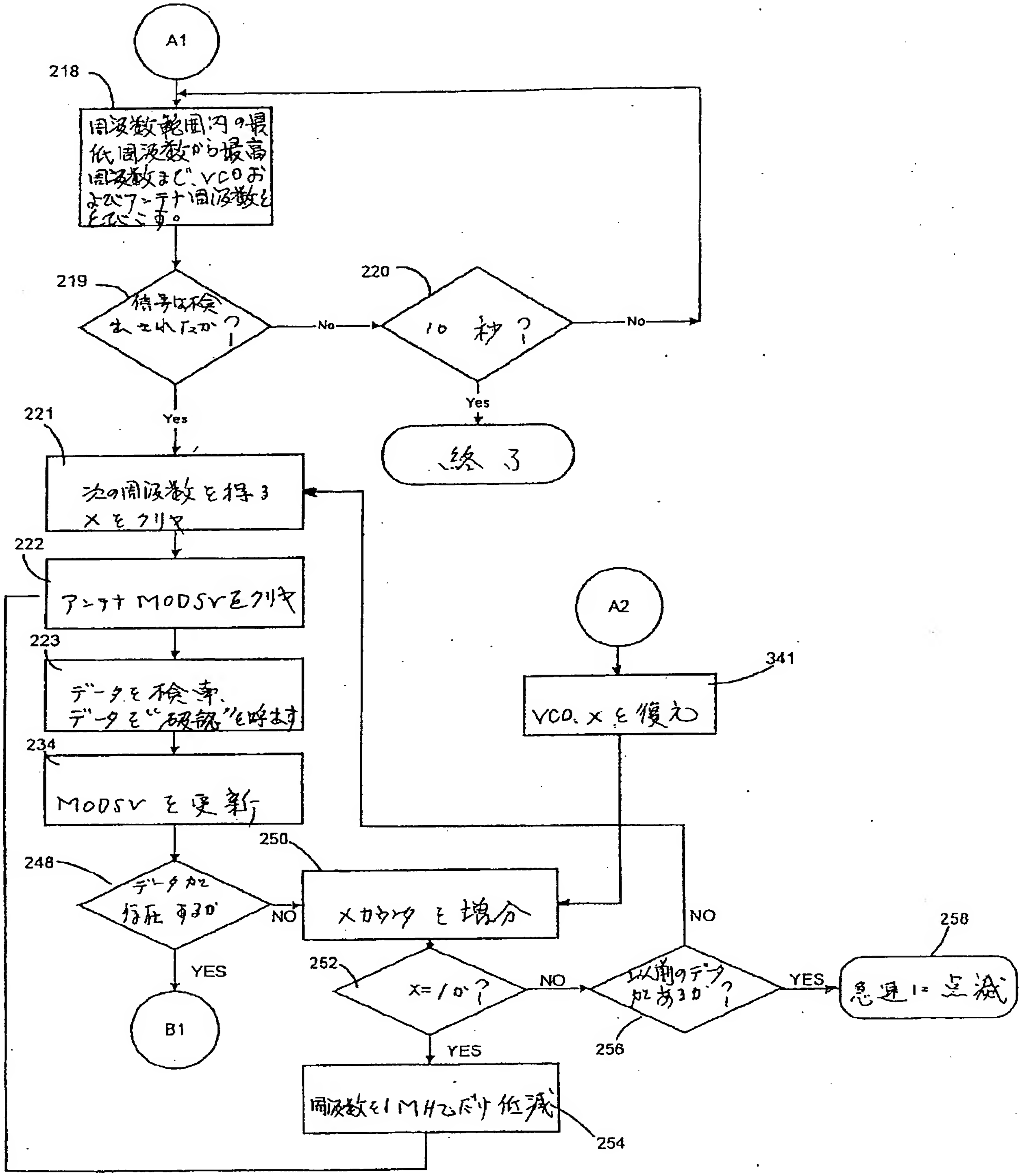
[Drawing 10]


200
ボタンが押される
201
ポート、RAMを初期設定する
202
タイマーを始動させる
203
チャンネル選択装置を読出す
204
チャンネルは訓練されたか?
No
Yes
205
選択されたチャンネルのNVMをRAMにダウンロードする
206
利得、周波数およびアンテナを設定する
207
固定コードか?
No
Yes
コードを発生するために暗号アルゴリズムを実施する。
209
208
コードを読出す
210
送信
217
2秒経過?
No
Yes
A1

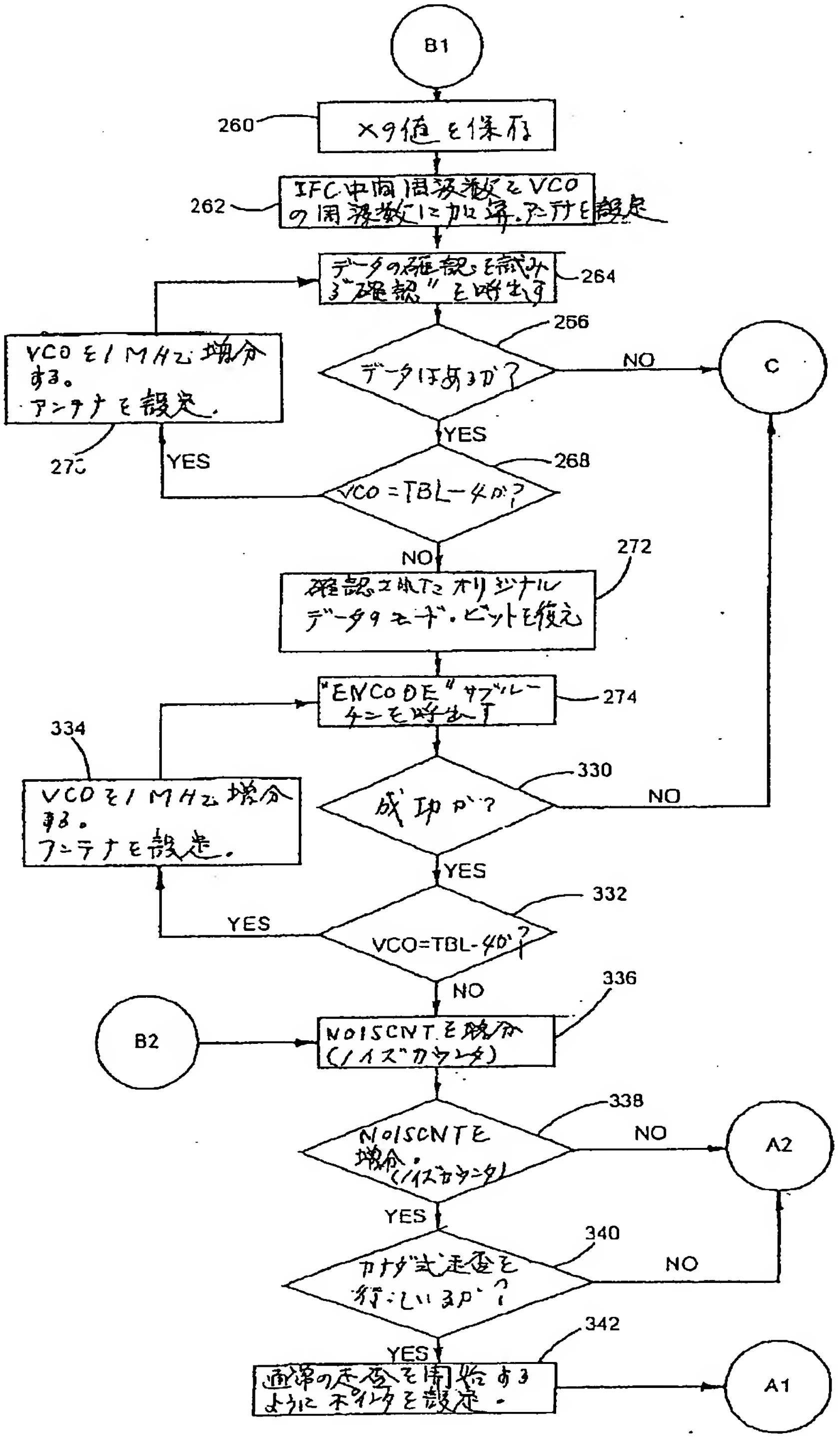
[Drawing 11]


211
F0−ΔF用のVCOの周波数を設定
212
x秒間送信
213
F0用のVCOの周波数を設定
214
x秒間送信
215
F0+ΔF用のVCOの周波数を設定
216
x秒間送信

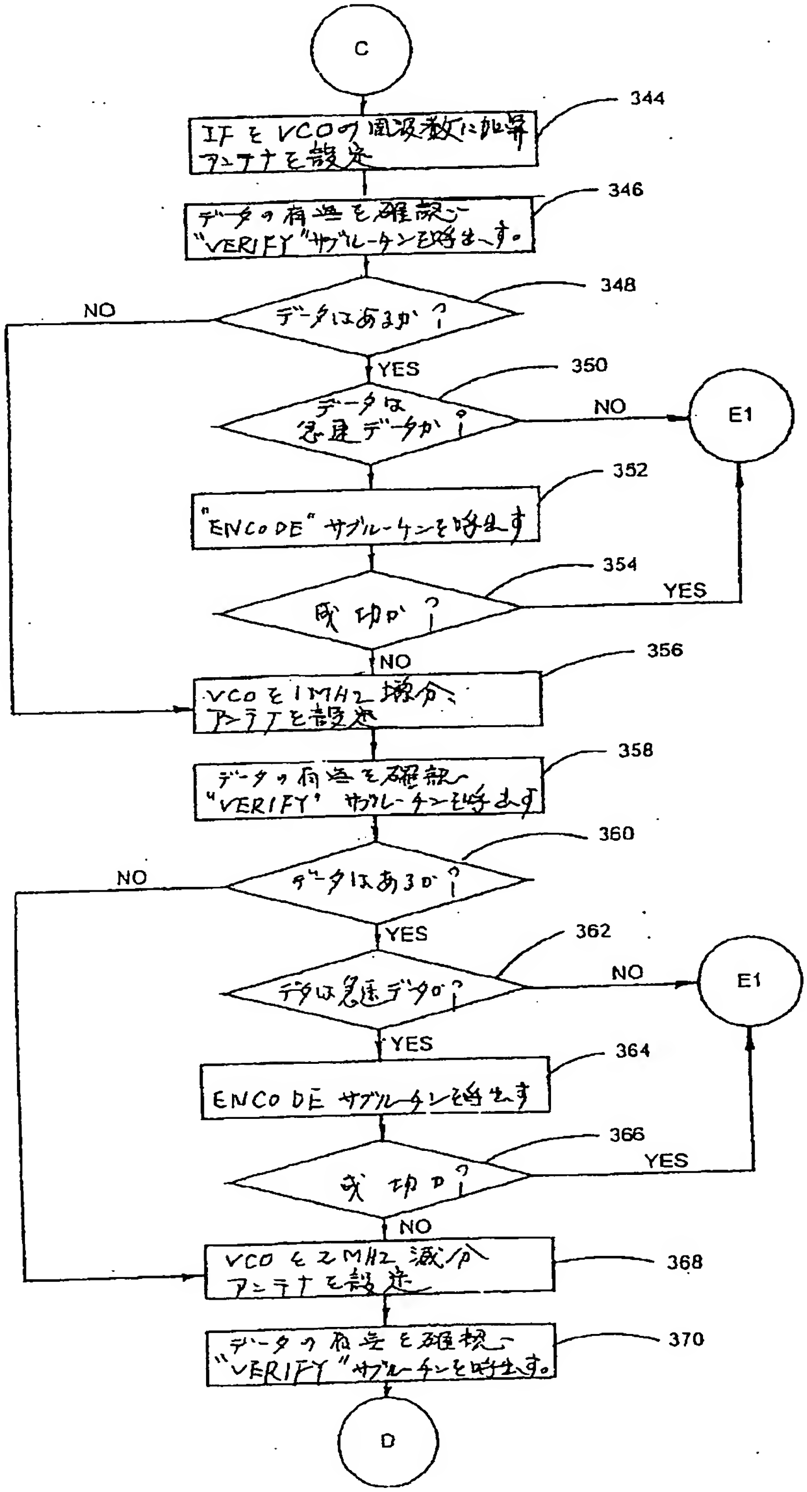
[Drawing 12]


A1
218
周波数範囲内の最低周波数から最高周波数まで、VCOおよびアンテナ周波数をとびこす。
219
信号は検出されたか?
No
220
10秒?
No
Yes
終了
Yes
221
次の周波数を得る
Xをクリア
222
アンテナMODSVをクリア
223
データを検索、
234
MODSVを更新
248
データが存在するか
NO
YES
B1
250
Xカウンタを増分
A2
341
VCO、Xを復元
NO
252
X=1か?
NO
YES
256
以前のデータがあるか?
YES
258
急速に点滅
254
周波数を1MHzだけ低減

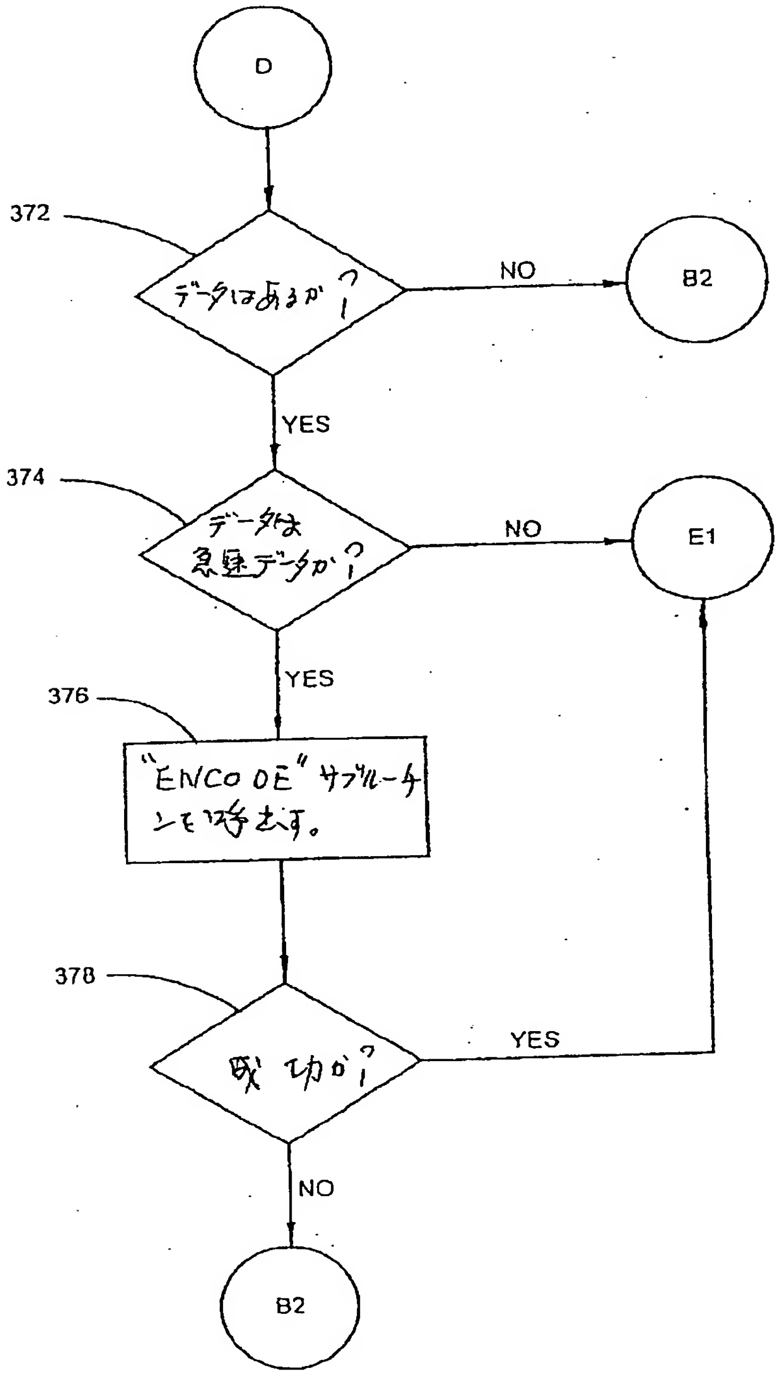
[Drawing 13]


B1
260
メタ値を保存
262
IFC中間周波数をVCOの周波数に加算。アンテナを設定
264
データの確認を試み"確認"を呼出す
266
データはあるか?
NO
C
YES
VCOを1MHzで増分する。アンテナを設定。
270
YES
268
VCO=TBL-4か?
NO
272
確認されたオリジナルデータのモード・ビットを復元
"ENCODE"サブルーチンを呼出す
274
334
330
VCOを1MHzで増分する。アンテナを設定。
成功か?
NO
YES
332
YES
VCO=TBL-4か?
NO
336
B2
NOISCNTを減分(ノイズカウンタ)
338
NOISCNTを増分(ノイズカウンタ)
NO
A2
YES
340
カナダ式走査を行っているか?
NO
342
YES
通常の走査を開始するようにポインタを設定
A1

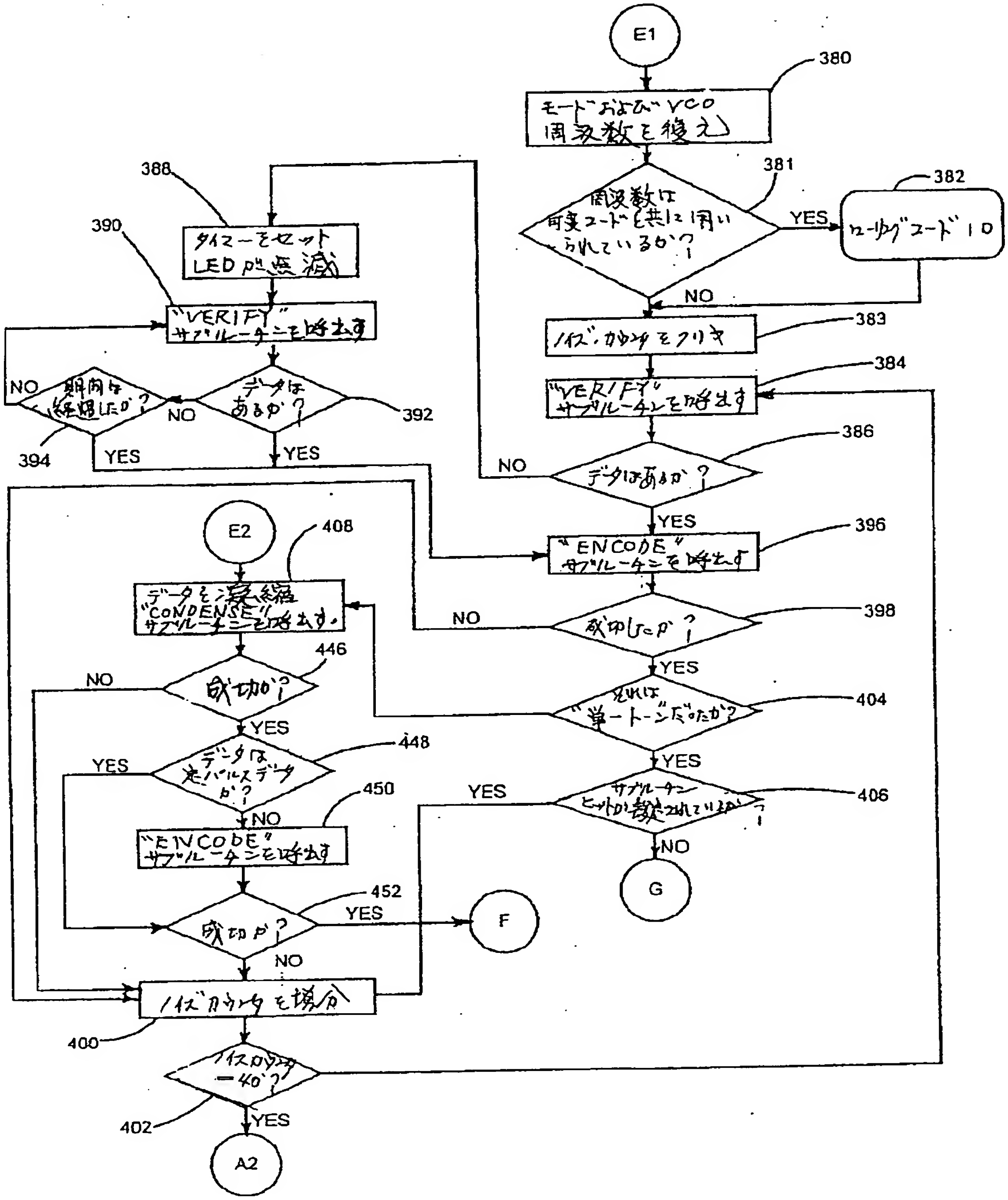
[Drawing 14]


C
344
IFをVCOの周波数に加算
アンテナを設定
346
データの有無を確認し
"VERIFY"サブルーチンを呼出す。
348
NO
データはあるか？
YES
350
データは
急速データか？
NO
E1
352
"ENCODE"サブルーチンを呼出す
354
YES
成功か？
NO
356
VCOを1MHz増分し
アンテナを設定
358
データの有無を確認し
"VERIFY"サブルーチンを呼出す
360
NO
データはあるか？
YES
362
NO
データは急速データか？
E1
YES
364
ENCODEサブルーチンを呼出す
366
YES
成功か？
NO
VCOを2MHz減分
アンテナを設定
368
データの有無を確認し
"VERIFY"サブルーチンを呼出す。
370
D

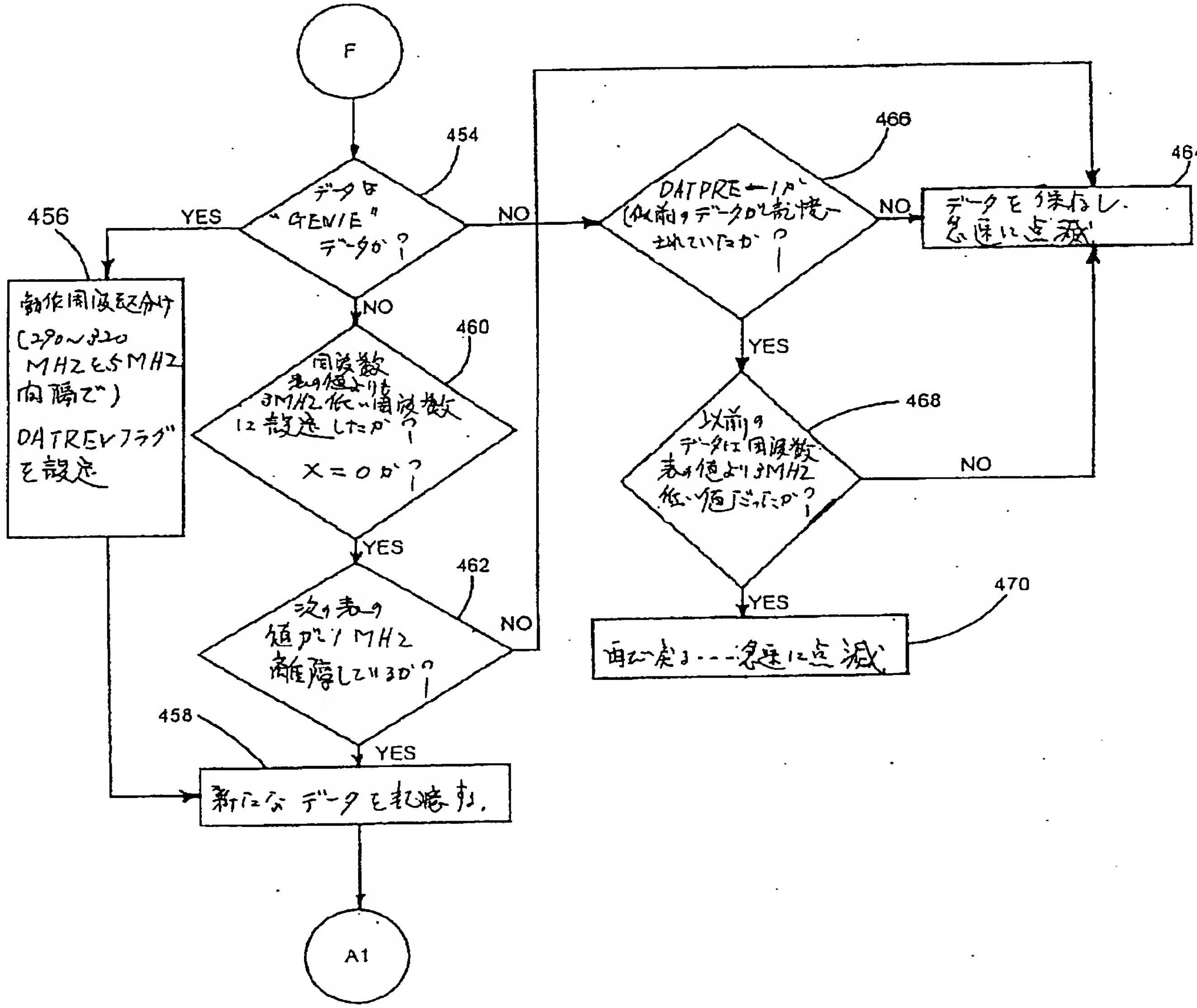
[Drawing 15]


D
372
データはあるか？
NO
B2
YES
374
データは
NO
E1
YES
376
"ENCODE"サブルーチンを呼出す。
378
成功か？
YES
NO
B2

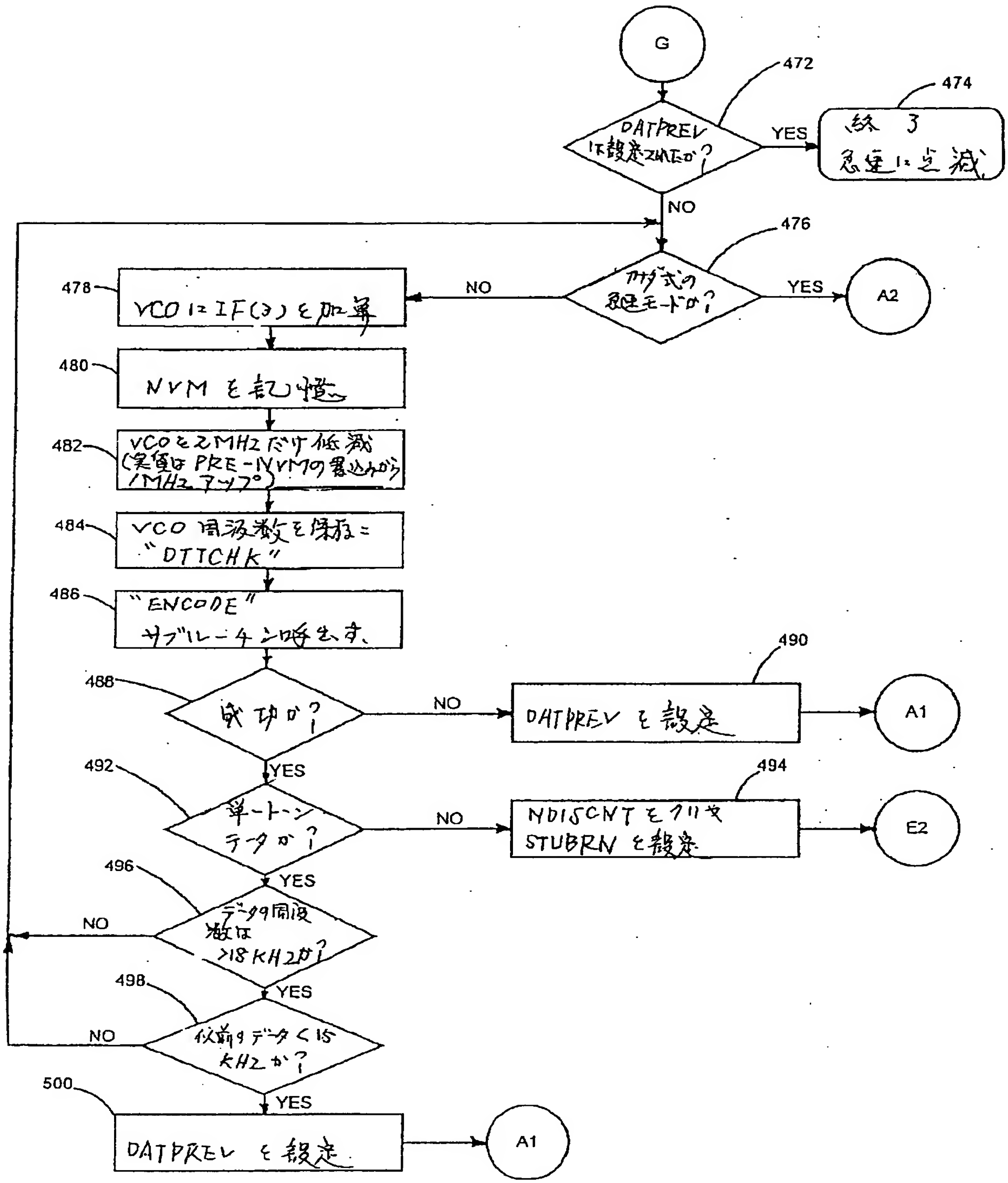
[Drawing 16]


E1
380
381
382
383
384
386
388
390
392
394
396
398
400
402
404
406
408
446
448
450
452
"VERIFY"
"ENCODE"
"CONDENSE"
LED
YES
NO
E2
F
G
A2

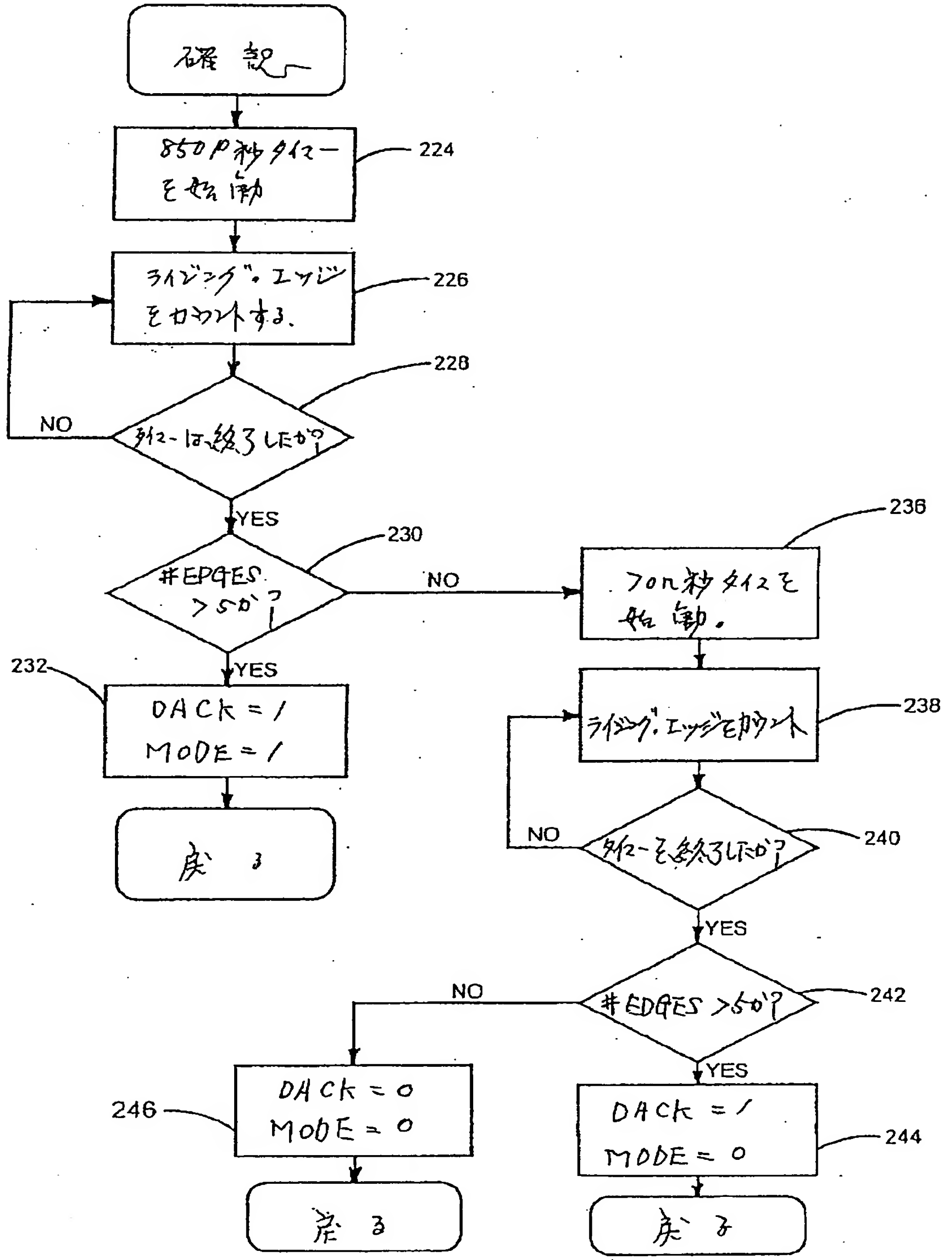
[Drawing 17]


F
454
データは"GENIE"データか?
YES
NO
456
動作周波数を分け(290~320MHzを5MHz間隔で)
DATREVフラグを設定
460
周波数表の値よりも3MHz低い周波数に設定したか?
X=0か?
462
次の表の値が1MHz離隔しているか?
458
新たなデータを記憶する。
A1
466
DATPRE=1か(以前のデータが記憶されていたか?)
464
データを保存し、急速に点滅
468
以前のデータは周波数表の値より3MHz低い値だったか?
470
再び戻る…急速に点滅

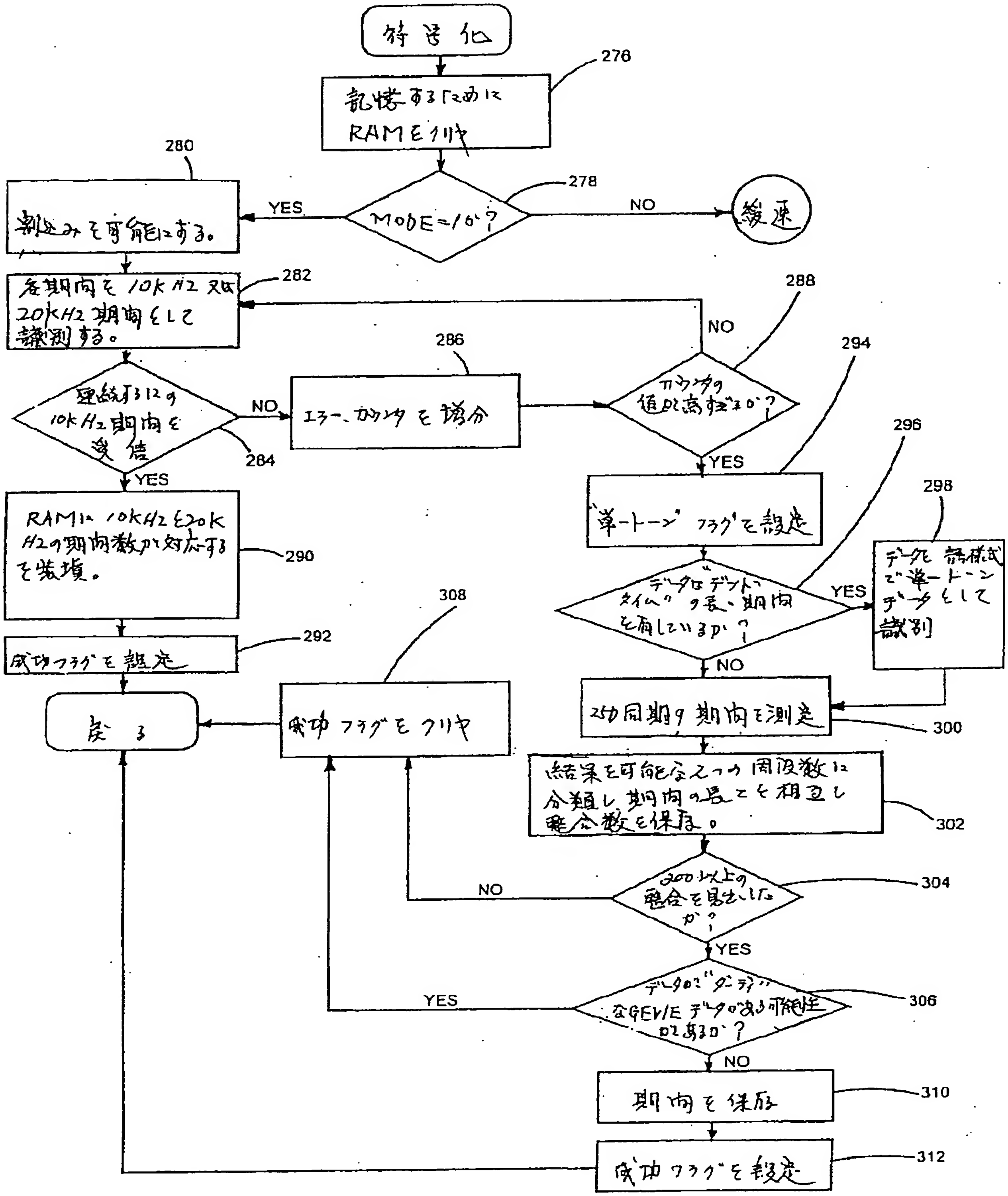
[Drawing 18]


G
472
DATPREV は設定されたか?
YES
474
終了
NO
476
YES
A2
NO
478
VCOにIF(3)を加算
480
NVMを記憶
482
VCOを2MHzだけ低減
(実値はPRE-NVMの書込みから
1MHzアップ)
484
VCO周波数を保存=
“DTTCHK”
486
“ENCODE”
サブルーチン呼出す。
488
成功か?
NO
490
DATPREVを設定
A1
YES
492
単一トーン
データか?
NO
494
NDISCNTをクリヤ
STUBRNを設定
E2
YES
496
データの周波数は
>18KHzか?
NO
YES
498
以前のデータ<15
KHzか?
NO
YES
500
DATPREVを設定
A1

[Drawing 19]

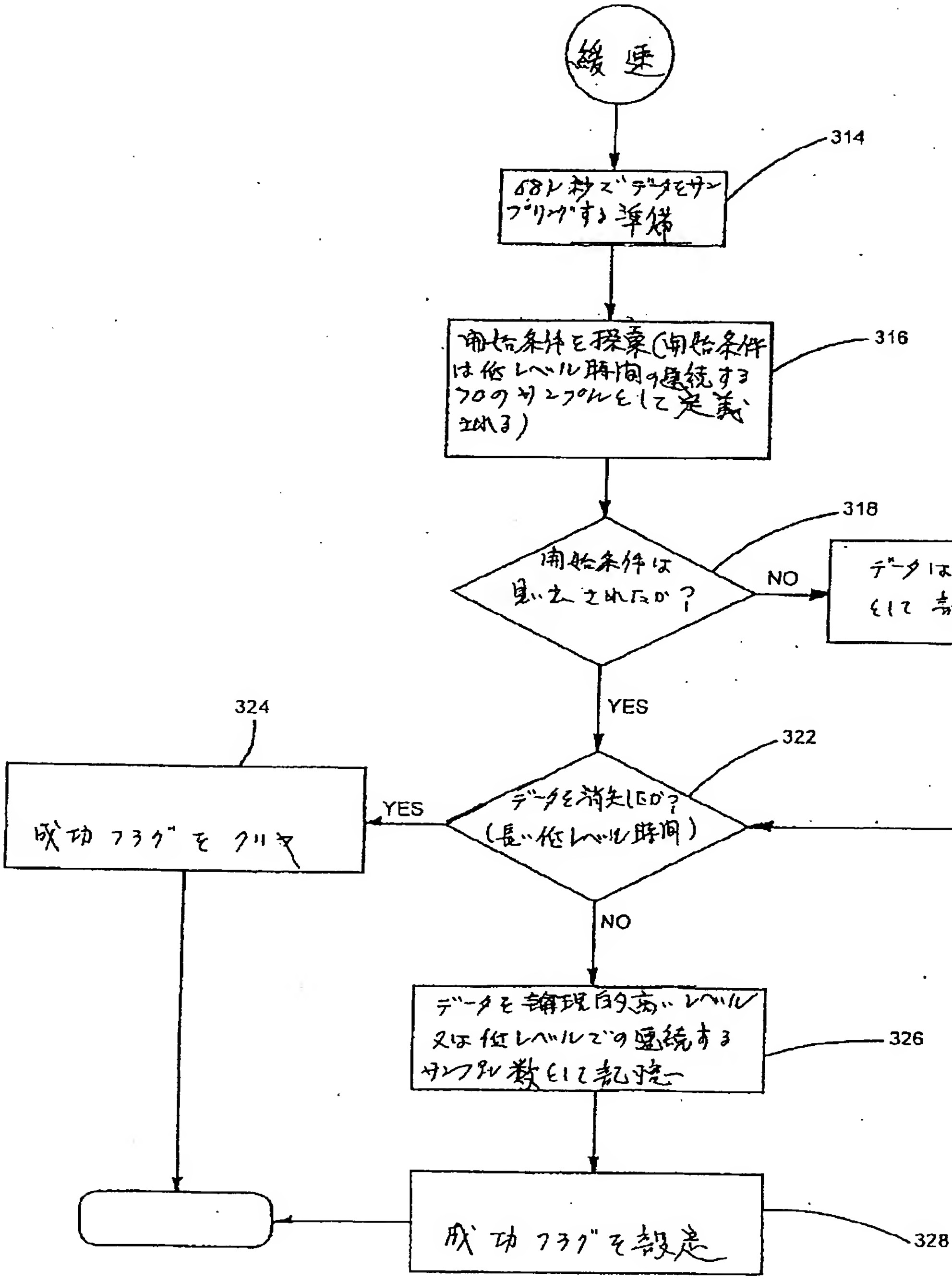

確認
850μ秒タイマーを始動
224
ライジング・エッジをカウントする。
226
タイマーは終了したか?
228
NO
YES
#EDGES >5か?
230
NO
70n秒タイマを始動。
236
ライジング・エッジをカウント
238
タイマーを終了したか?
240
NO
YES
#EDGES >5か?
242
NO
YES
232
DACK=1
MODE=1
戻る
246
DACK=0
MODE=0
戻る
DACK=1
MODE=0
244
戻る

[Drawing 20]

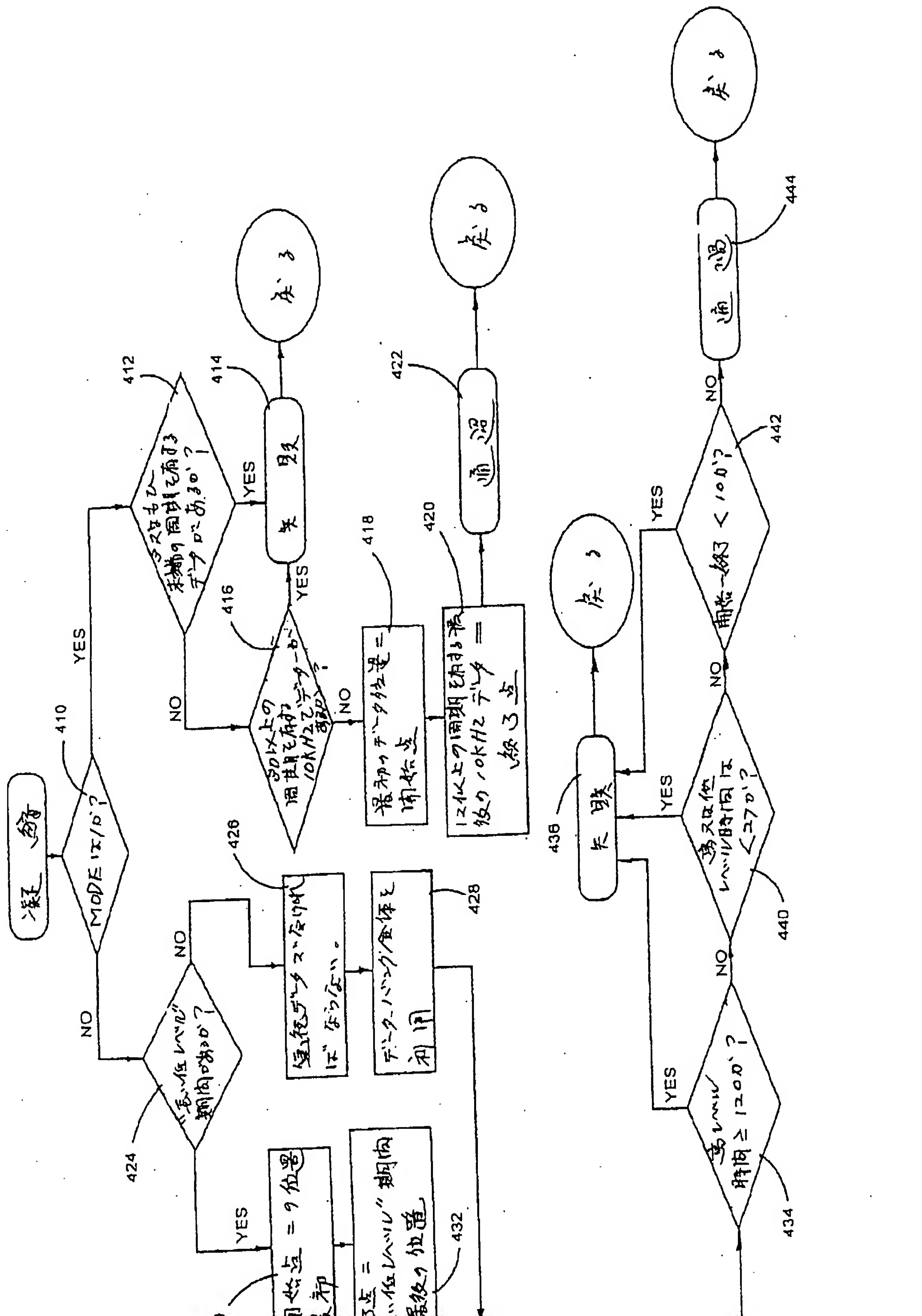


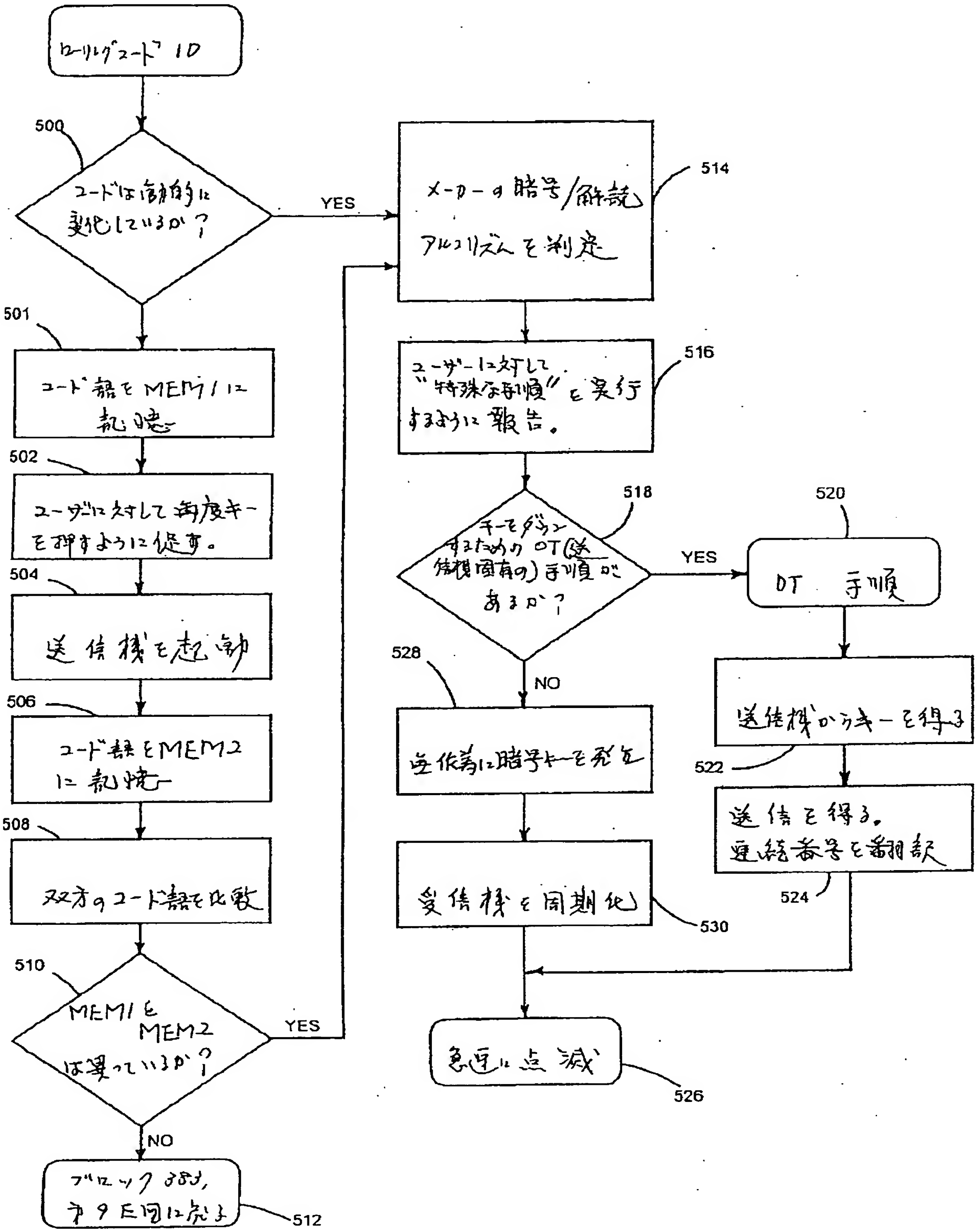
276
278
280
282
284
286
288
290
292
294
296
298
300
302
304
306
308
310
312
YES
NO
MODE=1か?
RAMにクリヤ
戻る
成功フラグをクリヤ
成功フラグを設定
期間を保存

[Drawing 21]

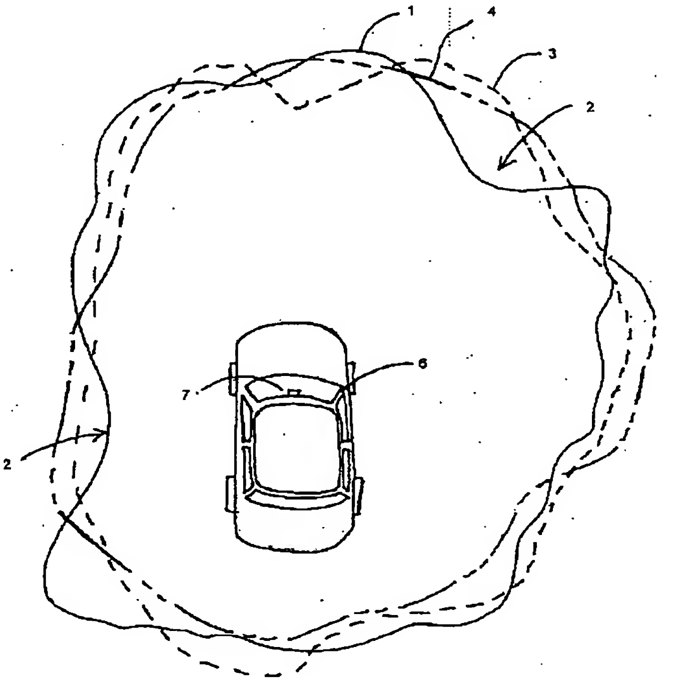

緩速
314
68μ秒でデータをサンプリングする準備
316
開始条件を探索(開始条件は低レベル時間の連続する70のサンプルとして定義される)
318
開始条件は見い出されたか?
NO
320
データは遅パルス、データとして識別される。
YES
322
データを消失したか?(長い低レベル時間)
YES
324
成功フラグをクリヤ
NO
326
データを論理的高いレベル又は低レベルでの連続するサンプル数として記憶
328
成功フラグを設定

[Drawing 22]


410
412
414
416
418
420
422
424
426
428
432
434
438
440
442
444
YES
NO


ローリングコードID
500
コードは自動的に変化しているか？
YES
514
メーカーの暗号/解読アルゴリズムを判定
501
コード語をMEM1に記憶
502
ユーザに対して再度キーを押すように促す。
504
送信機を起動
506
コード語をMEM2に記憶
508
双方のコード語を比較
510
MEM1とMEM2は異っているか？
YES
NO
512
516
ユーザーに対して"特殊な手順"を実行するように報告。
518
キーをダウンするためのOT(送信機固有の)手順があるか？
YES
520
OT手順
522
送信機からキーを得る
524
送信を得る。連続番号を翻訳
528
NO
無作為に暗号キーを発生
530
受信機を同期化
526
急速に点滅

[Drawing 24]


1
4
3
2
6
7
2